Frontispiece.

PLATE I

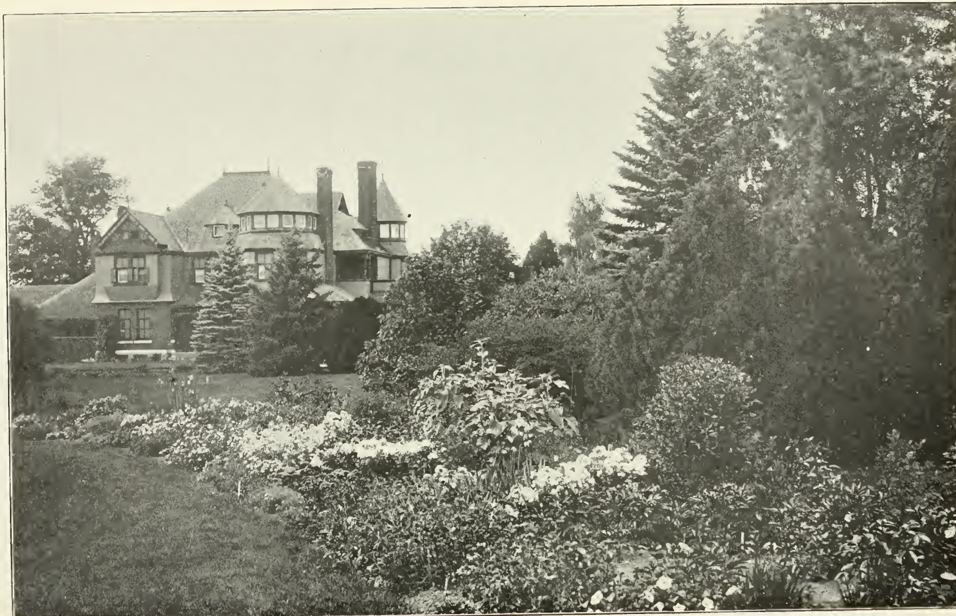

Photo by Frank T. Shutt.

Part of Perennial Border, Central Farm, Ottawa.

16—1914

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR	J. H. GRISDALE, B. AGR.
DOMINION FIELD HUSBANDMAN, (ACTING)	J. H. GRISDALE, B. AGR.
" CHEMIST (ASST. DIRECTOR)	FRANK T. SHUTT, M.A.
" HORTICULTURIST	W. T. MACOUN.
" CEREALIST	C. E. SAUNDERS, PH. D.
" BOTANIST	H. T. GÜSSOW
" ENTOMOLOGIST	C. GORDON HEWITT, D.Sc.
" ANIMAL HUSBANDMAN	E. S. ARCHIBALD, B.A., B.S.A.
" AGROSTOLOGIST	M. O. MALTE, PH.D.
POULTRY HUSBANDMAN	A. G. GILBERT
TOBACCO HUSBANDMAN	F. CHARLAN.
SUPT. EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.	J. A. CLARK, B.S.A.
" " FARM, NAPPAN, N.S.	R. ROBERTSON
" " STATION, KENTVILLE, N.S.	W. S. BLAIR.
" " STATION, FREDERICTON, N.B.	W. W. HUBBARD.
" " STATION, STE. ANNE DE LA POCATIERE, QUE.	JOS. BEGIN.
" " STATION, CAP ROUGE, QUE.	GUS. A. LANGELIER
" " FARM, BRANDON, MAN.	W. C. McKILLICAN, B.S.A.
" " " INDIAN HEAD, SASK.	ANGUS MACKAY
" " STATION, ROSTHERN, SASK.	WM. A. MUNRO, B.A., B.S.A.
" " " SCOTT, SASK.	R. E. EVEREST, B.S.A.
" " " LETHBRIDGE, ALTA.	W. H. FAIRFIELD, M.S.
" " " LACOMBE, ALTA.	G. H. HUTTON, B.S.A.
" " FARM, AGASSIZ, B.C.	P. H. MOORE, B.S.A.

FOR THE YEAR ENDING MARCH 31, 1913.

PRINTED BY ORDER OF PARLIAMENT

PRINTED BY C. H. PARMELEE, PRINTER TO THE KING'S MOST
EXCELLENT MAJESTY
1914

[No. 16—1914.]

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, March 31, 1913.

SIR,—I have the honour to submit herewith, for your approval, the twenty-sixth annual report of the work carried on at the several Dominion Experimental Farms and Stations.

As will be noted, the matter in this report is arranged in a different way to that which has obtained in former years.

Section A contains my report as Director, in which are incorporated accounts of the preliminary work on the new Experimental Stations at Invermere and at Sidney, British Columbia, as well as a résumé of the results obtained on the Sub-stations at Grouard, Grande Prairie, Athabaska Landing and Fort Vermilion, in Alberta, and at Kamloops and Salmon Arm, in British Columbia.

This is followed by synopsis of the work in the various Divisions on the Central Farm and at the branch Farms and Stations, with general notes on some of the features of the year's operations. For the preparation of these, I am indebted to the chief officers of the Divisions here, and to the Superintendents of the branches.

The section is concluded by brief reports from the Superintendents of several of the newer Stations, where experimental work has not yet been so well established as to permit of a detailed account of the year's work.

Section B contains detailed reports on the various lines of experimental work under way throughout the Dominion Experimental Farms system during the year. These have been prepared by the Dominion officers having supervision of such work on the Central and branch Farms in collaboration with the Superintendents of the latter.

These detailed reports fall under the heads of Animal Husbandry, Agrostology, Botany, Cereal Breeding and Variety Testing, Chemistry, Entomology, Field Husbandry, Horticulture (including Vegetable Gardening and Flowers), Poultry Husbandry and Tobacco Husbandry.

The detailed report on Poultry Husbandry at the Central Farm is very brief this year. The synopsis included in Section A was prepared only in part by Mr. A. G. Gilbert. Mr. Gilbert was siek during a great part of the year, hence the experimental work earried on here was small, and the report thereon, with the few statistics which make up the Ottawa part of the detailed report under the above heading, has been put into shape by Mr. V. Fortier, Assistant Poultry Husbandman.

Seetion A, which provides a coneise, yet eomprehensive, aeeount of the work, is designed especially for those desirous of obtaining general information as to what is being done on the Experimental Farms system.

Section B is intended more immediately to aid the farmer in the various details of his work.

It is hoped that this new arrangement, whieh groups together the year's work along any one line, will prove more convenient and useful to the farming community than the former system, whereby such work was recorded in widely separated portions of the report.

I have the honour to be, Sir,
Your obedient servant,

J. H. GRISDALE,
Director, Dominion Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

CONTENTS

SECTION A.

ANNUAL REPORT OF THE EXPERIMENTAL FARMS

FOR THE YEAR ENDING MARCH 31, 1913

REPORT OF THE DIRECTOR

J. H. GRISDALE, B.Agr.

NOTES ON THE SEASON'S CROPS.

The figures given in the following tables are taken from the Census and Statistics Monthly, issued by the Department of Trade and Commerce.

The total area under field crops in the Dominion in 1912 was 32,449,000 acres, a decrease of 404,074 acres from the total for 1911. This was due to the smaller area in hay and clover, which was 426,000 acres less than in 1911. In other crops there were slight increases in area.

The total value of all field crops grown last year, calculated at local market prices, is set at $511,951,000, while, in 1911, the return was $565,711,600, calculated on the same basis, a decrease of $53,760,600.

This was caused by both lower yield and lower values in many cases.

The tables below give the results in more detail.

Comparison of Yields and Prices obtained for the years 1911-12.

Crop.	Average Yield per Acre.		Average Price per Bushel.		Total Production.	
	1911.	1912.	1911.	1912.	1911.	1912.
	Bush.	Bush.	$	$	Bush.	Bush.
Fall wheat	22·19	20·99	825	·84	26,014,000	16,396,000
Spring wheat	20·63	20·37	·611	·60	189,837,300	182,840,000
Oats	37·76	39·25	·364	·32	348,187,600	361,733,000
Barley	28·94	31·10	·566	·46	40,641,000	44,014,000
Rye	18·89	19·06	·774	·73	2,694,400	2,594,000
Peas	15·80	15·04	1·025	1·26	4,506,100	3,773,500
Buckwheat	22·69	26·34	·641	·62	8,155,500	10,193,000
Mixed grain	29·78	34·38	·607	·59	16,679,000	17,952,000
Flax	11·41	12·92	1·507	·91	12,921,000	21,681,500
Beans	19·06	17·40	1·920	2 20	1,155,600	1,040,800
Corn for husking	59·39	56·58	·648	·62	18,772,700	16,569,800
Potatoes	143 82	172·19	·60	·39	66,023,000	81,343,000
Turnips, etc	373·92	402·51	·23	·23	84,933,000	87,505,000
	Tons.	Tons.			Tons.	Tons.
Hay and clover	1·61	1·47	11·55	11·07	12,694,000	11,189,000
Fodder corn	9·92	10·26	4·84	4·74	2,577,200	2,858,900
Sugar beets	8·66	10·74	6·58	5·00	177,000	204,000
Alfalfa	2·24	2·79	9·868	11·65	227,900	310,100

COMPARISON of Eastern Canada Prairie Provinces and British Columbia as to Yields and Prices obtained.

Crop.	Eastern Provinces.				Western Provinces.				British Columbia.	
	Average Yields per Acre. Bush.		Average Prices.		Average Yields per Acre. Bush.		Average Prices.		Average Yields per Acre.	Average Prices.
	1911.	1912.	$ 1911.	$ 1912.	1911.	1912.	$ 1911.	$ 1912.	Bush. 1912.	$ 1912.
Fall Wheat	20·95	20·63	·872	·92	24·93	21·87	·733	·67	33·00	1·03
Spring Wheat	17·95	18·33	1·00	·97	20·73	20·97	·607	·59	30·33	·93
Oats	28·88	32 56	·473	·49	46·64	44·90	·281	·25	56·00	·51
Barley	25·8	27·97	·712	·696	31·56	32·95	·465	·34	45·33	·64
Peas	......	18·81	......	1·536	...	......	......	....	30·66	1·38
Rye	17·47	16·74	·819	·84	27·30	25·56	·610	·56	......	......
Flax	13·57	9·66	1·87	1·69	11·40	12·75	1·50	·95	..	....
Potatoes	134·7	192·12	·636	·418	194·6	217·63	·448	·38	233·15	·49
Turnips	384·2	377·78	·216	·27	299·4	306·55	·355	·46	415·90	·53
	Tons.	Tons.	Per ton.	Per ton.	Tons	Tons.	Per ton.	Per ton.	Tons.	Per ton.
Hay and Clover	1·64	1·44	11·57	11·20	1·65	1·70	10·93	8·73	2·28	17 45
Sugar Beets	8·53	11·16	6·73	5·00	8·00	7·00	5·00	5·00	. . .	......
Alfalfa	2·22	2·72	10·81	10·55	2·47	2·49	......	10·52	4·20	17·00

METEOROLOGICAL RECORDS AT OTTAWA.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, from April 1, 1912, to March 31, 1913, giving maximum, minimum, and mean temperature for each month, with date of occurrence, also, the rainfall, snowfall, and total precipitation.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°		In.	In.	In.		In.	
April.........	49·20	28·95	20·25	39·07	67·0	15th...	7·0	1st....	2·60	2·00	2·80	13	0·68	7th.
May....	66·49	46·02	20·46	56·25	82·0	28th...	33·0	14th...	5·15	.....	5·15	17	1·44	24th.
June.........	73·68	49·58	24·09	61·62	88·4	24th...	39·4	7th...	1·35	....	1·35	14	0·42	6th.
July.........	81·17	56·94	24·19	69·03	95·8	7th...	45·6	31st....	3·89	......	3·89	13	0·83	15–16th.
August........	71·89	53·20	18·68	62·54	81·5	14th...	40·4	30th...	4·94	......	4·94	19	1·18	25th.
September.....	66·01	49·97	16·04	58·01	80·0	7th...	28·5	30th...	4·01	......	4·01	20	0·62	10th.
October... .. .	58·39	39·47	18·91	48·92	75·0	6th...	26·2	16th...	2·47	......	2·47	15	0·66	23rd.
November	40·89	27·96	12·93	34·42	58·4	6th...	5·2	28th...	2·59	23·00	4·89	13	2·10	25th.
December......	30·85	14·47	16·37	22·65	50·0	6th...	—4·8	21st....	1·17	10·00	2·17	17	0·81	19th.
January......	29·65	12·16	17·49	20·90	42·0	31st....	—16·0	13th...	2·17	23·75	4·54	21	0·92	3rd.
February.....	21·02	0·19	20·83	10·60	37·8	21st...	—18·0	25th...	T	23·50	2·35	14	0·70	14th.
March....... .	34·99	17·38	17·60	26·18	58·8	24th...	—14·2	8th...	2·20	24·25	4·62	16	0·60	9th.
	..	......	......	......	......	......	.....	....	32·54	106·50	43·18	192	....	......

Rain or snow fell on 192 days during the 12 months.
Heaviest rainfall in 24 hours, 1·44 inches, on May 24.
Heaviest snowfall in 24 hours, 21·00 inches, on November 25.
The highest temperature during the 12 months was 95·8, on July 7.
The lowest temperature during the 12 months was:—18.0, on February 25.

During the growing season, rain fell on 13 days in April, 17 days in May, 14 days in June, 13 days in July, 19 days in August, and 20 days in September.

April, July, and November show the lowest number of days with precipitation, viz., 13 each.

Total precipitation during the 12 months, 43·18 inches, as compared with 29·95 inches during 1911-12.

RAINFALL, Snowfall, and Total Precipitation from 1890 to 1912-13; also, the average annual amount that has fallen.

Year.	Rainfall.	Snowfall.	Total Precipitation
	Inches.	Inches.	Inches.
1890	24 73	64 85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39 04
1894	23 05	71 50	30 20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	35·97
1899	33·86	77·25	41·63
1900	29·48	108 00	40 72
1901	29·21	97·25	38·91
1902	25·94	101 75	36·10
1903	26·43	85·00	34·92
1904	25·95	108·75	36·79
1905	23 71	87 25	32 42
1906 January 1st to March 31st	1·90	24·50	4.34
1906–07	21 73	72 50	28·94
1907–08	24 70	134·75	38 18
1908–09	22 13	107 90	32·91
1909–10	28·40	61·25	34 51
1910–11	18·94	88·25	27·72
1911–12	20 12	98·50	29·95
1912–13	32·54	106·50	43·18
Total for 23 years and 3 months	596 05	2135·25	809·81
Average for 23 years	25·91	92·83	35·20

RECORD of Sunshine at the Central Experimental Farm, Ottawa, from April 1, 1912, to March 31, 1913.

MONTHS.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine. per day.
April	26	4	234·6	7·82
May	25	6	204·3	6·59
June	29	1	308·6	10·28
July	30	1	312·5	10·08
August	30	1	178·8	5·76
September	22	8	102·1	3·40
October	26	5	173·0	5·58
November	20	10	83·8	2·79
December	17	14	66·2	2·13
January	21	10	94 4	3·04
February	26	2	124·2	4·43
March	20	11	107·7	3·47

WILLIAM T. ELLIS,
Observer.

PUBLICATIONS ISSUED DURING THE YEAR.

In addition to the Annual Report of the Experimental Farms, there were issued, during the year ending March 31, 1913, the following:—

A Guide to the Dominion Experimental Farms and Stations. This was brought out in several editions, one covering the whole Experimental Farm system, and the others dealing with the Maritime Provinces, Quebec, Ontario, the Prairie Provinces and British Columbia, respectively. A description of each Experimental Farm is given, with an account of the work being taken up at each. The book is profusely illustrated with maps and plates, and is intended to serve both as a guide to visitors to the Farms and as an acceptable form of reply to inquiries as to the lines of work being carried on.

In the regular series of bulletins, No. 72, on Milk Production in Canada, was prepared by the writer of this report.

In it, an effort has been made to cover the ground of dairying, dairy breeds, the breeding and feeding of dairy cattle, diseases of dairy cattle, buildings, and dairy farming in general, in as complete a manner as possible within the limits of a bulletin. Especial attention has been given to treating the subject in a practical manner and to presenting it in an easily understood form.

In the second series, there have been issued:—

Bulletin No. 10, on the Large Larch Sawfly, by the Dominion Entomologist, Dr. C. G. Hewitt. This bulletin gives the results of the author's work and observations on this destructive insect.

Bulletin No. 11, entitled 'Legislation to prevent the Introduction and Spread of Insects, Pests and Diseases Destructive to Vegetation, with Regulations regarding the Importation of Vegetation into Canada.' This publication, issued by the Dominion Entomologist, gives the legislation and regulations, with latest amendments, along the lines stated in the title.

No. 12, on 'Feeding for Beef in Alberta,' by G. H. Hutton, B.S.A., Superintendent of the Experimental Station at Lacombe, Alta., gives the results of a series of tests in steer feeding at the Lacombe Station.

No. 13, on 'Experiments in Steer-Feeding in Manitoba,' by W. S. McKillican, B.S.A., Superintendent of the Experimental Farm at Brandon, Manitoba, gives the results of steer-feeding experiments at the Experimental Farm there. In both these bulletins the possibility of profitable steer-feeding is demonstrated.

No. 14, on 'Corn Growing in Manitoba,' by W. S. McKillican, B.S.A., was prepared with a view to make the growing of Indian corn for ensilage more popular and widespread in Manitoba. The results of experiments in this line on the Brandon Farm are given, suitable varieties are named, and correct cultural methods suggested.

Of pamphlets, three have been issued, all by the Dominion Horticulturist, Mr. W. T. Macoun:—

No. 9, Hardy Rose Culture in Canada; No. 10, Tomato Culture; and No. 11 on Cabbage and Cauliflower Culture.

Of circulars, three were issued by the Division of Botany:—

No. 1, Potato Canker imported into Canada; No 2, The Orange Hawk-weed; No. 3, Potato Canker.

Nos. 1 and 2 are coloured cards, with descriptive matter, designed to hang up in post offices, schools, etc. No 3 gives a fuller description of the disease illustrated in No. 1.

Two entomological circulars were issued: No. 1, by J. M. Swaine, M.Sc., on Tent Caterpillars, giving the life-history of this insect, and discussing methods for its control; and No. 2, by Arthur Gibson, on Flea Beetles and their Control.

CORRESPONDENCE.

The correspondence of the Experimental Farm system, as listed below, may be divided into letters of administrative and of technical character, the former having to do with the conduct of the Farms themselves, and the latter, which comprises most of the correspondence with the public, being made up principally of replies to inquiries on all classes of subjects relating to agriculture. It is not only a great advantage to Canadian farmers to have an institution such as the Dominion Experimental Farms to which they can refer their difficulties, but the letters received from them are also, on the other hand, a great aid to the Experimental Farm officers in keeping in touch with the farmer.

The various officers of the Central and Branch Farms are at all times glad to receive communications from those desiring information on subjects related to agriculture in its many phases.

The number of letters received and sent from the different Divisions of the Central Farm and from the Branch Farms and Stations is shown in the following table:—

Division.	Letters Received.	Letters Sent
Director's Office	20,642	12,072
Animal Husbandry	1,354	2,143
Field Husbandry	358	1,089
Horticulturist	5,820	6,330
Cerealist	13,430	3,077
Chemist	2,736	2,658
Entomologist	5,105	6,938
Botanist	2,107	2,531
Agrostologist	188	296
Poultry Division	4,833	6,463
French Correspondent	7,886	5,615
Miscellaneous	16,565	4,939
Totals	81,024	54,151

REPORTS, BULLETINS AND CIRCULARS.

Reports and bulletins mailed	16,475
Circulars *re* distribution Seed Grain	29,603

BRANCH FARMS AND STATIONS.

Farm or Station.	Letters Received.	Letters Sent.
Charlottetown	1,116	1,242
Fredericton	964	1,121
Nappan	3,924	3,618
Kentville	2,216	2,464
Ste. Anne de la Pocatière	256	194
Cap Rouge	1,701	2,027
Brandon	3,469	3,278
Indian Head	13,391	13,212
Rosthern	1,813	1,921
Scott	668	642
Lethbridge	2,975	3,137
Lacombe	4,304	3,821
Agassiz	3,150	3,373
Totals	39,947	40,050

These totals for the Branch Farms and Stations are exclusive of reports, bulletins and circulars sent out.

By adding the figures for the Central and Branch Farms, the total number of letters received is seen to be 120,971 and of those sent, 94,201.

SEED DISTRIBUTION.

The annual distribution of samples of seed grain and potatoes was carried on. All applications for grain were filled from Ottawa, as well as most of those for potatoes, coming from Ontario and Quebec. The details of the distribution from Ottawa are given further down, where mention is made of this and other work of the Dominion Cerealist, to whose charge it is entrusted. In addition to the seed sent from Ottawa, amounting in all to 8,276 samples, there were distributed from the Branch Farms and Stations, 5,224 samples, as follows:—

Charlottetown	28
Nappan	484
Brandon	367
Indian Head	2,788
Lethbridge	280
Lacombe	858
Rosthern	176
Agassiz	243
	5,224

There was, in addition, a large distribution of inoculated soil for growth of alfalfa, made especially from the Western Farms, as well as a distribution of sweet corn from the Cap Rouge Station to applicants in Quebec, and of tree seeds, etc., from the Prairie farms.

After supplying the grain required for this distribution, the remainder, after keeping what was required for seed next year, was sold in lots of from two to six bushels.

NEW BUILDINGS.

An extension to the Chemical Laboratory on the Central Farm was practically completed this year. The increased work of this Division made such an extension most necessary, and will enable it to take up lines of work heretofore unattempted owing to lack of laboratory room.

A cow barn, to accommodate twenty-four milch cows, was also built. It is constructed with a view to experimental work in feeding and pure milk production. Arrangements are also made for research into the comparative digestibility of feeds.

On the Branch Farms and Stations, the heaviest building operations took place on the Experimental Station at Kentville, N.S., the Experimental Farm at Indian Head, Sask., and the Experimental Station at Lacombe, Alta. On several of the other Farms and Stations buildings were erected also, as mentioned further on in this report.

NEW DIVISIONS FORMED.

It was decided this year to subdivide the work heretofore carried on by the Dominion Agriculturist. This step was made necessary by the rapid expansion of the work, rendering it impossible for any one officer to do justice to all the different lines of experiment.

Two Divisions have been formed as a result, those of Animal Husbandry and of Field Husbandry.

A third Division, that of Forage Plants, was also formed during the year. The officer at the head of this Division is known as the Dominion Agrostologist, and has to do with the study of forage plants and roots, with a view to the breeding of new varieties, as well as the testing of sorts now known. Work is being carried on at Ottawa and, to some extent, at the various Branch Farms. The Division will work in conjunction with the Divisions of Animal Husbandry and of Field Husbandry, as to the practical testing of varieties produced.

For the past year, the work of the Division of Field Husbandry has been carried on by Mr. O. C. White, B.S.A., under my supervision.

During the year, the Tobacco Division, which heretofore had been a separate branch of the Department, became a part of the Experimental Farms system, its chief officer, Mr. F. X. Charlan, remaining in charge. In addition to the experimental work carried on by this Division on the Central Farm at Ottawa, branch Tobacco Stations are established at Harrow, in Ontario, and at Farnham and at St. Jacques de l'Achigan, in Quebec.

ADDITIONS TO AND CHANGES IN THE STAFF.

In June, 1912, Mr. E. S. Archibald, B.A., B.S.A., was appointed Dominion Animal Husbandman.

He was born at Yarmouth, N.S., May 12, 1885, and received his primary education at Yarmouth Public School and Yarmouth Academy. He entered Acadia University in 1901 from which he took his Arts degree in 1905. He also graduated from the Nova Scotia Horticultural School in the same year, and from Nova Scotia Agricultural College in 1906. He received his degree of Bachelor of Scientific Agriculture from the Ontario Agricultural College, in the year 1908. During the summers of 1904 to 1908 he worked on several of the largest stock farms in the Maritime Provinces and Ontario, in the capacity of assistant husbandman, herdsman and farm foreman. In the fall of 1908, he accepted the position of Instructor of Agriculture and Experimentalist at the Nova Scotia Agricultural College. He was raised to the position of Professor of Agriculture and Farm Superintendent at the Nova Scotia Agricultural College, in the year 1910. In June, 1912, he resigned his position in Nova Scotia to accept the

position of Dominion Animal Husbandman on the Central Experimental Farm, Ottawa.

Dr. M. O. Malte, Dominion Agrostologist, was born in Southern Sweden in 1880. After attending Preparatory School and Collegiate Institute, he passed examinations for entrance into the University of Lund, in Southern Sweden, in 1898.

After having been graduated a Bachelor of Science and, later, Licentiate of Science (corresponding to Master of Arts), he defended successfully before the Faculty of the University of Lund a thesis in botany for the degree of Doctor of Philosophy, in 1910.

While studying at the university, he was, during a number of years, engaged as assistant at the Botanical Gardens connected with the university. During three consecutive summers, 1904-7, he was engaged as assistant at the Plant Breeding Station of Svälof, Sweden, working with grasses and clovers.

During the two years immediately preceding his coming to Canada he was engaged as a teacher in Natural Science at the Collegiate Institute of Kristianstad, in Southern Sweden.

Since October, 1910, he has been connected with the Dominion Department of Agriculture, Ottawa, at first with the Seed Branch of this department and later, since May, 1912, with the Central Experimental Farm.

He has published the following scientific bulletins and pamphlets: First, Physiological investigation on the cell-enclosures in the orchidaceous plants (German); second, *Epilobium hirsutum* x *Montanum,* a new hybrid (Swedish); third, *Alchemilla pratensis,* in Sweden (Swedish); fourth, the Construction of the Nucleus in the family of *Euphorbiaceæ* (Swedish); fifth, Embryological and Cytological Investigations on *Mercurialis annua* (Swedish); sixth, Seed Types in Forage Plants (Washington).

During the time he was connected with the Seed Branch he was engaged in writing in co-operation with Mr. Geo. H. Clark, Seed Commissioner, a book on 'Fodder and Pasture Plants', which is now being printed.

During the winter just passed, the former Poultry Manager, Mr. A. G. Gilbert, found that his health would no longer permit him to take that active part in poultry work incident to the position which he had held, as officer in charge of the Poultry Division, since the organization of the Dominion Experimental Farms, in 1886.

While surrendering his onerous duties as chief to his successor, Mr. F. E. Elford, he has consented to remain on the staff of the Poultry Division, acting in an advisory and consultative capacity, a position in which his wide experience will prove of the greatest value.

Mr. Gilbert may justly lay claim to being a pioneer in the poultry business, as that term is now understood. Previous to his appointment as Poultry Manager, in 1886, he conducted a profitable poultry farm near Ottawa, and it was, no doubt, owing to his marked success therein, that he first received that position in the Government service he has since so ably held.

In addition to carrying on experimental work along many lines, Mr. Gilbert's services have yearly been in great demand as a lecturer on poultry topics, and there is, perhaps, no speaker on that subject more widely or more favourably known throughout Eastern Canada.

Mr. F. C. Elford, lately appointed Dominion Poultry Husbandman, was born in Waterloo county, Ont., in 1871. Two years later, he accompanied his parents to Holmesville, Huron county, living with them on the farm. From 1877 to 1887, he went to the public school there, and from the latter date, until 1891, attended the Clinton High School.

During the years 1893-4 and 1896-7, he attended the Ontario Agricultural College at Guelph, specializing in poultry work, and afterwards taking special work with Professor L. G. Jarvis.

Outside of the time spent at school and college, he worked on the farm and took an interest in Farmers' Institute work, being secretary of the West Huron Farmers' Institute for five years, and speaking for several winters on the Institute staff.

From 1900 to 1903, he managed a Dominion Poultry Station for the Department of Agriculture, and in the latter year, upon the resignation of Mr. F. C. Hare, he took charge of the Poultry Division, Live Stock Branch, under Professor J. W. Robertson. After remaining here two years, he resigned to take the management of the Poultry Department at Macdonald College, under Dr. Robertson.

Nearly seven years were spent at Macdonald, until, in January, 1912, he took up work with the Cyphers Incubator Co., of Buffalo, N.Y. After six months, he left Buffalo to take the management of the Canadian Incubator Co., Toronto, and while filling this position was appointed Dominion Poultry Husbandman. This is a newly-created office, whose incumbent is in charge of poultry breeding and feeding operations at the Central Experimental Farm, as well as at the different branch Farms of the Dominion Experimental Farms system, throughout which it is proposed to do very considerable poultry work in the future.

Mr. W. S. Blair, Superintendent of the Experimental Station, Kentville, N.S., was born at Onslow, Colchester county, Nova Scotia, August 24, 1873. After his early training in the country school, one winter was spent at the Ontario Business College, Belleville, Ont. This was followed by two years at Mount Allison Academy, taking, in addition to the regular course of studies, chemistry, physics, botany and geology. Two years were spent at the Nova Scotia Horticultural School, Wolfville, N.S., from which a diploma was granted. When attending the horticultural school, special studies were taken in the natural sciences at Acadia College.

He was appointed Horticulturist, Maritime Experimental Farm, Nappan, N.S., in 1897, which position he resigned, in 1905, to take charge of the Horticultural Department at Macdonald College, P.Q., which department he had the management of until he resigned in June, 1912, to assume the duties of Superintendent of the Experimental Station for the Annapolis Valley at Kentville.

On April 19, 1907, he received the appointment from McGill University of Assistant Professor of Horticulture at Macdonald College. On October 5, 1909, by order of the Board of Governors of McGill University, he was appointed Professor of Horticulture at Macdonald College, with a seat on the Faculty of Agriculture.

He was appointed Superintendent of the Kentville Experimental Station, June, 1912.

Mr. Joseph Bégin, appointed to the position of Superintendent of the Experimental Station at Ste. Anne de la Pocatière, Que., was born in 1870 in the parish of St. Jean Chrysostôme, where he received his education up to the age of fourteen, after which he took the 'Landry' popular course in agriculture in vogue at that time. After working a year on his father's farm, he entered the nurseries of Caron and Dusseault, of St. Henri, to obtain a practical knowledge of horticulture and arboriculture. In 1885, he went to the Canadian West, where he held positions with the Hudson Bay Company and with the Canadian Pacific Railway Company.

Returning to Quebec in 1895, he bought 90 arpents of land, part unbroken and the remainder in a very poor state of cultivation. This, the St. Isidore Farm, was classed fifth in 1908 in the Good Farm competition of the county. He was the first, if not the only one, to practise scientific dairying in the parish, and to adopt and follow regular rotations. With poultry, he has studied systems of artificial incubation and also the problems connected with the construction of sanitary, comfortable and cheap poultry houses.

Mr. W. W. Hubbard was appointed to the office of Superintendent of the Experimental Station at Fredericton, N.B., on the 1st of October, 1912.

He was born in 1866 and brought up on a farm on the St. John river, at Burton, Sunbury county. At the age of fifteen, he matriculated into the Agricultural College at Guelph, Ontario, where he graduated as a Live Stock Specialist, in April, 1884. He then returned to New Brunswick and joined with his father in conducting the farm at Burton.

He was for many years secretary of the Farmers' and Dairymens' Association of New Brunswick. During this time he was engaged by the Government of Canada as a dairy specialist and was for some years in charge of the Experimental Stations at Kingsclear and Sussex, N.B., and organized local dairy associations throughout the province, under the direction of Dr. James W. Robertson, then Dairy Commissioner for Canada. He was also actively interested in many other matters having to do with advanced agriculture, during the period from his graduation to 1908.

After the provincial elections of 1908, which resulted in the accession of the Hazen Government to power, a Royal Commission was appointed by that Government to make a thorough inquiry into the agricultural conditions and possibilities of New Brunswick, and Mr. Hubbard was chosen one of its members, and its secretary. He also acted as official reporter of the legislature for New Brunswick for the sessions of 1908-9.

Shortly after the report of the Agricultural Commission was presented to the Government, in 1909, Mr. Hubbard was appointed Secretary for Agriculture for the province, holding the rank of deputy head of the department, and in that capacity assisted in giving effect to some of the recommendations of the Agricultural Commission, through which the number of agricultural societies in the province has been more than doubled, the horticultural branch organized, the poultry industry encouraged, and much work done for the improvement of live stock and agricultural education generally.

He resigned from his position of Secretary for Agriculture to accept his present appointment.

Mr. G. B. Rothwell, Assistant Dominion Animal Husbandman, was born at Ottawa, in 1884. His early training was received at Ottawa Public Schools, Collegiate Institute, and at his father's dairy farm near Ottawa. In 1901, he entered the Ontario Agricultural College, taking the Agricultural and Live Stock option, and graduating in 1905. He then returned to his home, becoming identified with extensive dairy interests there. Mr. Rothwell was appointed to his present position in 1912.

Mr. F. L. Sladen, Assistant Entomologist for Apiculture, was born in England, in 1876, and has been engaged in bee-keeping since boyhood. He has conducted apiaries with a view to honey production on a large scale, and has done valuable work in bee improvement, having succeeded in producing a breed of great value for crossing.

In addition to a booklet on the bumble-bee, published at the age of sixteen, he is the author of *Queen-rearing in England,* published in 1905. This work describes the methods employed in breeding the new bee referred to above.

In 1912, he brought out an extensive work on the bumble-bee, covering the results of many years' investigations.

In 1910, he made a tour in Canada and the United States, visiting prominent bee-keepers. He has made several important discoveries in the morphology and physiology of the honey-bee.

He has been employed by the Indian government to select and ship to India different varieties of the honey-bee, and by the Canterbury Agricultural and Pastoral Association of New Zealand, to select and ship to that Dominion new species of bumble-bees.

Mr. Sladen's training in entomology, as well as apiculture, opens a large field of usefulness to him in Canada.

Mr. J. M. Robinson, Assistant to the Superintendent of the Experimental Station, Kentville, N.S., was born in Berwick, N.S., in 1886. Until he was eighteen years old his time was divided between working on his father's farm and attending the Public and High Schools at Berwick. After leaving school, at eighteen, he was engaged in farming until twenty-two.

In the fall of 1908, he entered the Nova Scotia Agricultural College, at Truro, N.S., and in the following year continued his studies in agriculture at Macdonald College. In 1912, he graduated from the latter with the degree of B.S.A. Upon graduation he was appointed to his present position.

Mr. Milton J. Tinline, Assistant Superintendent at the Experimental Farm, Brandon, Man., was born in York county, Ontario. In 1890, his father moved to Elkhorn, Man., where the son received his Public and High School education. After leaving school, he had charge of his father's farm at Elkhorn until the autumn of 1906, when he entered the Manitoba Agricultural College, graduating with the pioneer class, in 1911. The following summer he held the position of foreman on the College farm, and during the winter had charge of their seed-testing laboratory. In the spring of 1912, he was appointed to his present position, in which he has special charge of the Cultural Investigation work.

Mr. Robert Whiteman, Assistant to the Superintendent of the Experimental Farm at Indian Head, Sask., was born and brought up near Russell, Man. At the age of twenty-two, he entered the Manitoba Agricultural College, graduating in the spring of 1912. During his college course he did considerable work for the provincial governments, attending fairs, and lecturing at Institute meetings. In the spring of 1912, he was appointed to his present position.

In September, 1912, Mr. H. Sirrett, B.S.A., Assistant to the Dominion Cerealist, resigned that position to join the staff of the *Canadian Countryman*. The resulting vacancy was filled by the appointment of Mr. Robert Newton, B.S.A.

Mr. R. Newton was born at Montreal, Que., in 1889. His early education was obtained in the Public and High Schools of that city.

The years 1903-8 were spent in practical farm work at Plaisance, Que. In 1908 he entered upon the four years' agricultural course at Macdonald College. While at this institution he spent two summers engaged in cereal work under the direction of Prof. L. S. Klinck, and specialized in cereal husbandry in his fourth year.

After graduating in 1912, he was appointed district representative for Macdonald College in Pontiac County, Que., from which position he came to the Central Experimental Farm in March, 1913.

In December of last year, Mr. T. G. Bunting, B.S.A., Assistant to the Dominion Horticulturist, accepted the position of Professor of Horticulture at Macdonald College, in succession to Professor W. S. Blair, now Superintendent of the Experimental Station at Kentville, N.S.

NEW STATIONS.

An Experimental Station for the province of New Brunswick was established at Fredericton, in September, 1912.

It is situated about three miles below the city, fronting on the river St. John, and is crossed by the Canadian Pacific and the St. John Valley railroads.

The Station farm is made up of several properties, and is some 450 acres in extent. About one hundred acres of this had been in crop, the remainder of it being unbroken, and much of it uncleared. During the autumn and winter, considerable clearing and draining have been done.

About twenty acres were ploughed, and horses and some implements purchased.

There are no buildings suitable for an Experimental Station on the property, but it is hoped to erect several of those required during the coming year.

JOURNEYS MADE.

During the year, I visited the various branch Experimental Farms and Stations, and a number of the Substations. In some cases, where new Farms were being established, it was necessary to make several visits in connection with the general organization, the installation of new officers or the laying out of the farms in question.

In addition to the various above-mentioned visits of inspection, many other trips were undertaken during the year, probably the most important being (1), a trip to Fort George, B.C., made by automobile and steamer from Ashcroft over the Caribou trail to Soda creek, thence by steamer, as a usual thing, but in this case all the way by automobile, on the first one to enter Fort George. Several addresses were delivered on the fair grounds, and judging done of agricultural products and live stock of various kinds, as entered for competition at the first annual fair of the Fort George Agricultural Association, to attend which the trip had been undertaken.

While in the Fort George district, advantage was taken of the opportunity to make a number of excursions east and west of the Fraser river, and along the Nechaco. In practically every direction, crops being grown by settlers, most of whom had been in the country but a few years, bore witness to the wonderful fertility of the soil and the suitability of the climate to the production of grasses, vegetables, cereals and small fruits and to live stock farming. Some most remarkable crops of oats, potatoes and hay were inspected, and live stock of all kinds seemed to be doing exceedingly well.

(2.) A trip to Pullman, Washington, U.S.A., to look into land clearing methods, as practised by the Washington State Experiment Station staff at various points in the more heavily-wooded areas of the state, was also made. Clearing conditions there closely resemble those which obtain in many parts of British Columbia.

MEETINGS.

My duties as Director do not permit of my attending very many meetings as a speaker on agricultural or other subjects. I did, however, during the year speak at a number of points, among which might be mentioned the Maritime Fat Stock and Poultry Show, Amherst, N.S.; Fort George Agricultural Exhibition, Fort George, B.C.; Quebec Dairymens' Convention, Terrebonne, Que.; Ontario Entomological Society Meeting, Ottawa, Ont.; Eastern Ontario Dairymens' Convention, Kingston, Ont.; Eastern Ontario Fat Stock and Poultry Show, Ottawa, Ont.; Live Stock Association Meetings, Toronto, Ont.; Quebec Live Stock Association Meetings, Montreal, Que.; Manitoba Fat Stock Show, Brandon.; Quebec Seed Growers' Association, Quebec, Que.; Moosejaw Canadian Club; New Brunswick Farmers' Association, Fredericton, N.B.; and several Farmers' Clubs in different provinces.

REPORTS OF EXPERIMENTS AT FORT SMITH, RESOLUTION AND PROVIDENCE, MACKENZIE DISTRICT.

Owing to the very poor success in the experimental work at the above points last year, it was thought advisable to discontinue tests at them for the present. However, the Fathers in charge of the Missions at these Forts have reported on their work for the season of 1912. The results, as a whole, are more encouraging than those of 1911, especially at Forts Resolution and Providence.

FORT SMITH.

At Fort Smith the season was a bad one in every respect. The snow had completely disappeared by April 20, but the land could not be worked before May 8. On

the 9th and 10th some grain was sown, and vegetable seeds, such as White Flat Strap-leaf turnip, swedes, Half-long Chantenay and French Horn carrots, Early Blood-red and Egyptian-Red beets, and Red Wethersfield onions; Alaska, Cleveland's First and Best, McLean's Advancer and Gregory's Surprise peas; also, cabbage, radishes and lettuce.

On May 11, Banner and Siberian oats were sown, and also different varieties of wheat, rye and barley.

On the 17th there was a light snow fall, followed by a frost (26 degrees). This was followed by a drought, lasting throughout June, which did a great deal of injury. In July, hail fell, and this was followed by a frost. In August, there was frost again, which was especially injurious to the potato crop.

In brief, this has been the second consecutive year quite unfavourable for crops. It is thought, however, that better results will be obtained as more clearing is done. The nearness of the woods retains the moisture, so that, at the least fall in temperature, there is a frost. Every year, near the woods, there is frost, while in the clear space near the river, there is none. The land in the latter locality is not good, however, being very sandy and will only produce a crop when well manured.

In the garden near the house, in a sandy soil, turnips were grown weighing up to 8 pounds each; carrots did well, many weighing 1½ pounds each; beets up to 3 pounds, but a large proportion had too many roots. Onions did not do well, few germinated and these were very small. Peas did very well, though much later than the preceding year, not being ready for use until the end of July. They did not commence to ripen until the beginning of September. The Caractacus variety of pea seems still the best for this country, being earlier and more hardy. After these come Gregory's Surprise and Alaska, McLean's Advancer and Cleveland. First and Best is productive, but later. In another garden, some distance away, English Wonder and American Wonder peas were sown, but both sorts were frosted, owing to their nearness to the woods. The same happened to the tomatoes and beans. Squash produced a few flowers, but nothing afterwards.

Oats did well in spite of the unfavourable season. They were five feet high, and the three varieties tried yielded about the same. The potatoes, in the same field as the oats, were all frozen. The oats, sown on May 11, were not harvested until September 26.

Barley did not succeed, it being attacked with rust, and frozen.

FORT RESOLUTION.

At Fort Resolution, the results, as a whole, were good. The condition and variety of the field and garden crops were a surprise to travellers from the more settled districts.

The early part of June was dry, but there was a light rainfall on the 10th, and a heavy one on the 30th. July was cold. Rain during the latter part of August was of great benefit to the potato crop.

On September 17 there was a heavy storm from the north, the temperature fell rapidly and the weather thereafter remained cold.

Owing to the grain sown not being covered deeply enough, much of it was eaten by snowbirds, which are present in myriads each spring in that region.

Germination was slow, caused by the drought in spring, but by the middle of July, grain and vegetable crops had an excellent appearance. Considerable damage was done by a band of dogs getting into the garden enclosure at the Mission.

The yields of grain are not given, as the threshing was not well done, much of the grain being left in the straw. (It is a very difficult matter to secure trustworthy labourers from among the Indians at the Missions, and they will generally work for only a few days at a time.)

Four varieties of oats sown ripened from September 6 to 16, and four of wheat were ready to eut on the 16th of the same month. Three varieties of barley were ripe from September 2 to 6. Winter rye did not mature. Spring rye was ripe on September 16. All the above were sown on May 15.

Onions did not yield a crop this year. Carrots and beets, sown May 17, were pulled September 18.

Four varieties of cabbage tested were all destroyed by dogs. Three varieties of lettuce, sown May 18, were in use July 12 to 15. Turnips, sown May 20, were fit for use July 30, and four varieties of peas, sown May 14, were in use July 30. Gregory's Surprise ripened September 15.

Some cross-bred apple seeds, sown in the greenhouse, Mareh 18, produced plants ten to eleven inches high. Apple seeds sown in the open, did not come up. The two-year-old apple trees are some three feet high.

Ten varieties of flowers, sown in the greenhouse and transplanted May 14-20, bloomed from July 31 to August 31.

FORT PROVIDENCE.

The work at Fort Providence was not reported on very fully this year, as it was not well understood how mueh detail was required. Following are some notes on the results obtained:—

CEREALS.

Variety.	Sown.	Above Ground.	Headed.	Harvested.
Wheat	May 7	May 20	July 1	Sept. 10.
Barley	" 7	" 18	June 25.	Aug. 25.
Oats	" 7	" 21	July 1	" 28.
Rye	" 7	" 22	" 1	" 30.

Two varieties of clover were sown, but the growth was not very vigourous.

Lettuee, sown May 6, was above ground on June 3, and was fit for use June 22. Best varieties, Cos Trianon and Grand Rapids, both of whieh were cut four times.

Radishes were sown May 7, and were up on June 6. Fit for use June 20 to 25.

Garden peas were sown May 7, and were up on June 6. Pods were formed on July 15 and the erop was harvested September 4.

Cauliflowers, sown May 10, gathered August 7; one weighed 2 pounds and another 1¾ pounds.

Cabbages, sown in March in boxes in the house; planted in garden, May 15; harvested, September 15, to the number of 212, weighing from 4 to 5 pounds eaeh. The heaviest was 6½ pounds.

Table beets were, as a rule, small. Carrots were of fair size, but a light crop.

The potato erop totalled 1,014 barrels.

The last spring frost was on June 2. There was a slight frost on July 23, and the first frost of autumn occurred on August 31.

Flowers were not a suceess this year.

EXPERIMENTS AT FORT VERMILION, PEACE RIVER DISTRICT, ALBERTA.

The spring of 1912 opened very early, the snow starting to thaw during the early part of April. Seeding was begun on April 29, but was not general until May 2. May opened very dry and continued so throughout the month, and, as a result, growth was very slow. June was very dry and hot, with only 7/100 of an inch of rain during the whole month. This gave the crops a permanent set-back which all the rains of July could not remedy. The crops that were not ploughed under were very light.

July opened showery and cold, a slight frost occurring on the nights of the 9th, 14th and 19th, which did considerable damage. The first part of August was showery, and the ripening period was prolonged. From the 13th to the 24th, however, the weather was good, and considerable cutting was done on the experimental plots. Frost occurred three times towards the end of the month. Notwithstanding, everything on the Experimental Station was a decided success, the wheat, when threshed, showing a yield of from 45 to 69 bushels per acre. Some of the varieties tested were Red Fife, Marquis, Bishop and Preston. Kubanka, a durum wheat, yielded 34 bushels per acre.

Three varieties of oats were grown, the Banner, Tartar King and Improved Ligowo, yielding 60 bushels, 63 bushels 18 pounds, and 72 bushels 32 pounds, respectively. Four varieties of barley ranged in yield from 75 bushels 30 pounds to 55 bushels 30 pounds per acre.

Longfellow Red Nose corn gave a yield of 12 tons 360 pounds of green fodder per acre.

Four varieties of turnips gave from 16 tons 1,600 pounds, to 21 tons 1,440 pounds per acre; four varieties of mangels from 10 tons 1,600 pounds to 16 tons 1,600 pounds, four varieties of carrots from 8 tons 20 pounds, to 11 tons 500 pounds; and three varieties of sugar beets, from 8 tons 800 lbs to 18 tons per acre.

Five varieties of potatoes were tried, the Irish Cobbler giving the lowest yield, 96 bushels per acre, and the Carman No. 1 the highest, 288 bushels per acre.

No alfalfa was under trial this year, all the plots having been ploughed up.

Brome grass, sainfoin and canary grass gave good crops, the last-named at the rate of 4 tons per acre. Timothy, tall fescue, rye grass and awnless brome grass were poor, owing to drought in spring.

Vegetables did well, some of the specimens being of record size for the Peace River district; cabbage and cauliflower reached 15 pounds in weight, and other sorts in proportion. Varieties grown successfully in the open comprised asparagus, beans, table beets, carrots, celery, cucumbers, lettuce, parsley, garden peas, parsnips, radish, rhubarb, squash, spinach and table turnips. Tomatoes were cut down by frost on July 14.

Some twenty-nine varieties of flowers were sown in the open and gave a profusion of bloom until the first fall frost on September 23. Fourteen varieties sown in hotbeds and planted out late in May also did excellently.

Of seventy-three varieties of ornamental shrubs and trees, the records for the season indicate satisfactory growth and bloom in the great majority of cases. No winter-killing is reported.

In fruits, the cross-bred apple trees and their seedlings made from fair to very good growth, though none fruited this year. Plum trees did not do well.

Raspberries and black, red and white currants all fruited.

METEOROLOGICAL RECORDS.

Following will be found the meteorological records for Fort Vermilion and also a table comparing these with records taken at Ottawa.

Exhibit of Farm Products. Grouard, Alberta, Sept. 18 and 19, 1912.

View of part of Experimental Station, Fort Vermilion, Peace River District, Alberta.

Table of Meteorological Observations taken at Fort Vermilion, Peace River District, Alberta, from April 1, 1912, to March 31, 1913, showing maximum, minimum, and mean temperature, the highest and lowest for each month with date of occurrence, also, rainfall, snowfall, and total precipitation.

Months.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°		In.	In.	In.		In.	
April....	48·28	21·19	27·09	34·73	64·0	16th.....	9·9	14th ...	0·40	0·75	0·47	2	0·40	20th
May.....	69·61	33·53	36·08	51·57	103·0	15th.....	22·0	10th, 19th	0·57	.....	0·57	3	0·46	28th
June....	75·75	42·66	33·09	59·20	98·0	22nd	29·0	2nd, 30th	0·17	.....	0·17	4	0·06	27th
July.....	71·68	40·98	30·70	56·33	86·5	31st.....	25·0	14th.....	1·37	.....	1·37	9	0·41	20th
August.	71·60	43·10	28·50	57·35	98·0	17th.....	23·5	28th.....	1·80	....	1·80	11	0·94	9th
Septem..	64·83	27·51	37·32	46·17	80·5	16th.....	5·0	23rd.....	0·26	.....	0·26	3	0·11	18th
October..	46·24	22·48	23·76	34·36	66·0	16th.....	9·5	19th.....	0·76	2·00	0·96	5	0·40	1st
Novem ..	25·83	7·03	18·79	16·42	41·0	15th.....	--15·9	30th.....	0·18	2·25	0·40	5	0·12	29th
Decem ..	9·26	—14·72	23·99	— 2·73	46·0	9th.....	—43·5	1st	....	2·50	0·24	4	0·10	6th
January.	—10·78	—33·72	22·94	—22·25	18·3	28th.....	--64·5	20th.....	....	3·25	0·32	6	0·10	26th
Febr	11·63	—16·62	28·25	— 2·50	34·9	20th, 21st	—47·0	25th.....	...	4·00	0·39	4	0·30	13th
March ..	20·41	—13·35	33·76	3·53	53·5	28th.....	—40·5	18th.....	....	3·25	0·32	2	0·30	3rd
... ...	....	....	...	....	.....	....	.....	....	5·51	18·00	7·27	58	.....	....

Record of Sunshine at Fort Vermilion, Peace River District, Alberta, from April 1, 1912, to March 31, 1913.

Months.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
April........	25	5	170·1	5·67
May........	29	2	288·8	9·31
June........	26	4	288·6	9·62
July........	27	4	239·5	7·72
August........	23	8	194·5	6·27
September........	29	1	239·6	7·98
October........	16	15	104·5	3·37
November........	14	16	53·9	1·79
December........	18	13	62·8	2·02
January........	19	12	78·5	2·53
February........	23	5	120·4	4·30
March........	30	1	218·4	7·04

SOME WEATHER OBSERVATIONS taken at Central Experimental Farm, Ottawa, as compared with those taken at Fort Vermilion, Peace River District, Alberta.

	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Total Precipitation.	Heaviest in 24 hours.	Total hours Sunshine.	Average Sunshine per day.
APRIL.							
Ottawa	39°.07	67°.0	7°.0	2.80	0.68	234.6	7.82
Fort Vermilion	34°.73	64°.0	9°.9	0.47	0.40	170 1	5.67
MAY.							
Ottawa	56°.25	82°.0	33°.0	5.15	1.44	204.3	6.59
Fort Vermilion	51°.57	103°.0	22°.0	0.57	0.46	288.8	9.31
JUNE.							
Ottawa	61°.62	88°.4	39°.4	1.35	0.42	308.6	10.28
Fort Vermilion	59°.20	98°.0	29°.0	0.17	0.06	288.6	9.62
JULY.							
Ottawa	69°.03	95°.8	45°.6	3.89	0.83	312.5	10.08
Fort Vermilion	56°.33	86°.5	25°.0	1.37	0.41	239.5	7.72
AUGUST.							
Ottawa	62°.54	81°.5	40°.4	4.94	1.18	178.8	5.76
Fort Vermilion	57°.35	98°.0	23°.5	1.80	0.91	194.5	6.27
SEPTEMBER.							
Ottawa	58°.01	80°.0	28°.5	4.01	0.62	102.1	3.40
Fort Vermilion	46°.17	80°.5	5°.0	0.26	0.11	239.6	7.98
OCTOBER.							
Ottawa	48°.92	75°.0	26°.2	2.47	0.66	173.0	5.58
Fort Vermilion	34°.36	66°.0	9°.5	0.96	0.40	104.5	3.37

SOME WEATHER OBSERVATIONS taken at Central Experimental Farm, Ottawa, as compared with those taken at Fort Vermilion, Peace River District, Alberta.—*Con.*

	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Total Precipitation.	Heaviest in 24 hours.	Total hours Sunshine.	Average Sunshine per day.
NOVEMBER.							
Ottawa	34°.42	58°.4	5°.2	4.89	2.10	83.8	2.79
Fort Vermilion	16°.42	41°.0	—15°.9	0.40	0.12	53 9	1.79
DECEMBER.							
Ottawa	22°.65	50°.0	—4°.8	2.17	0.81	66.2	2.13
Fort Vermilion	—2°.73	46°.0	—43°.5	0.24	0.10	62.8	2.02
JANUARY.							
Ottawa	20°.90	42°.0	—16°.0	4.59	0.92	94.4	3.04
Fort Vermilion	—22°.25	18°.3	—64°.5	0.32	0.10	78.5	2.53
FEBRUARY.							
Ottawa	10°.60	37°.8	—18°.0	2.35	0 70	124.2	4.43
Fort Vermilion	—2°.50	34°.9	—47°.0	0.39	0.30	120.4	4.30
MARCH.							
Ottawa	26°.18	58°.8	—14°.2	4.62	0.60	107.7	3.47
Fort Vermilion	3°.53	53°.5	—40°.5	0.32	0 30	218.4	7.04

NOTE.—The records for Fort Vermilion are taken by Mr. R. Jones, of the Experimental Station there, and the tables therefrom are prepared by Mr. William Ellis, Weather Observer, Central Farm.

EXPERIMENTAL WORK AT ATHABASKA LANDING.

It is to be regretted that the pressure of other duties has compelled Bishop Robins to give up much of his experimental work at Athabaska Landing. In a letter received from him, he reports briefly on the character of the season of 1912 as follows:—

'The summer of last year was very dry at Athabaska Landing, and all garden industries suffered, by being dwarfed and late. Then, when rain came and a late spurt resulted, the August frost cut down all tender growth, including tomatoes,

cucumbers, squash and such things. The potato crop was satisfactory. Green peas were late and yielded for a shorter time than usual, the taller varieties again doing better than the dwarfs. Beets and onions were light; indeed, the root products of the garden suffered most from lack of moisture.

'The cutworm troubled cabbages, and I did not know of the Paris green method of destruction at the time.

'The fruit trees have not shown their possibilities yet. You will remember, I received a new consignment. The currants among them flowered and fruited at once, but the others had no opportunity, as growth follows quickly after the planting season. They will prove themselves better this year.'

EXPERIMENTAL WORK AT GRANDE PRAIRIE, ALTA.

In the report of the Experimental Farms for 1911-12, mention was made that Mr. S. J. Webb was to do some experimental work for the department at Grande Prairie.

The following letter was received from him, giving a brief report of his results for the season. It also gives some idea of the difficulties to be met in getting seeds and other supplies to these distant points in time for planting. The seeds referred to as reaching him on June 6 were sent from Ottawa early in April.

During the past winter we had a call from Mr. Webb, who brought a collection of very good samples of grains grown by him and by some of his neighbours in the Grande Prairie district.

In his report, Mr. Webb says:—

'The past season was, on the whole, very favourable for crops of all sorts in this locality. After an exceptionally mild winter, the spring opened early in April, and by the 20th seeding was in full swing. Stock came through the winter in good shape, and horses, which were on the range all winter, were in excellent condition.

'Harvest started about the 20th of August, wheat being fully ripe, none being frosted. Fall wheat has done very well in this district, there being several small acreages sown.

'Wheat yielded 30 bushels per acre; oats did not yield very heavily, running about 50 bushels per acre; although some reported larger yields, I did not see them. Barley went 56 bushels per acre, with excellent grain. Potatoes were a very good crop, and of extra good quality.

'I would estimate the grain crop of this district at 150,000 bushels.

'The seeds you sent me did not reach me until June 6, which was too late for sowing this year. I am keeping them for next year.

'This part is settling very fast, the people like the country and have come to stay. It is going to be one of the best districts in the west, and is especially adapted for mixed farming and stock raising. All we want is transportation and we have the rest.

'I have not received the thermometers sent from Toronto; they are on the trail somewhere between here and Edson. On account of the wet season it has been impossible to get express through, but I intend hunting them up on my way out. I expect to be in Ottawa this winter and will call on you.'

REPORT OF EXPERIMENTAL WORK AT GROUARD, LESSER SLAVE LAKE, ALBERTA.

The Fathers of the Mission were the first to practise farming at this point, on a large scale. Having begun agricultural operations in the district some eighteen years ago, they are now fairly in a position to give an exact report on the possibility of growing cereals, such as wheat, barley and oats, as well as roots and vegetables near Lesser Slave lake.

The village of Grouard is situated at the northwest end of Lesser Slave lake, and is bounded by the forest on the east side, with very little open ground between that and the lake. The arable land here is limited in area, but here and there one finds clear spaces for cultivation. The land bordering on the lake is very sandy. To extend the cultivated area it was necessary to clear the forest and, accordingly, about ten acres of new land was made. This work was commenced in 1894. The forest land is generally good, with four or five inches of humus on the surface. The subsoil is of friable clay. Grain does well on this land, but it has been little grown, potatoes and vegetables being sown in preference.

To grow the cereals, it was thought advisable to break some land about eight miles to the northwest of Grouard on a hillside sloping to the southeast. The soil on this area is of two kinds, the low land, a heavy clay, and the high land, a sandy loam, containing possibly thirty per cent of vegetable mould.

This land was cleared in part to commence with, and each year the clearing has been extended.

The success obtained in growing cereals and potatoes has been decided enough in spite of some temporary setbacks from drought and frost (the latter rarely, twice in eighteen years) to encourage the breaking of new land in order to practise rotations as far as required. These rotations allowed the sowing of some eighty acres in grain for several years without growing the same crop on the same land oftener than once in three years.

The harvest from the clayey and alkaline land is less than that on the higher land, which is a sandy loam. The former, however, always yields good, heavy grain, nearly always mature.

The spring of 1911 was particularly unfavourable at Grouard, as in all Alberta. The harvest was very late, although the grain was partly ripe. The bad harvest weather made it very difficult to save the grain harvested when damp, and the wheat especially heated in the shock. This injured its vitality greatly, as was evident the next spring.

Oats, sown on May 4, were harvested on September 2, 135 bushels yielding 1,578 bushels. The oats were sown in the most unfavourable location, a heavy clay, and owing to the extreme drought the straw was so short that about a third of the area was pastured.

Wheat, owing to low vitality of seed, was very light, forty bushels, sown on May 2 and harvested September 5, yielding 350 bushels.

Fifteen bushels of barley, sown May 1, yielded 186 bushels, harvested August 19. The grain was much blackened by heating.

It should be noted that the yield during the previous two years (1909 and 1910) was three times as great on the same area, seed of good vitality having been used. The seeding in 1911 could not be done at the usual time, April 20 to 25, owing to heavy falls of snow making outside work impossible. The rains of the previous autumn had also prevented the usual preparatory work.

Early Rose potatoes were sown May 18 and dug September 26. The field of three acres yielded 600 bushels, or about one-third of the return from a field of the same size in 1911.

Two varieties each of carrots, beets, onions and celery gave good returns. Cabbage, garden peas, beans, tomatoes, lettuce, radish, turnips, pumpkins and squashes, without exception, gave very satisfactory crops of properly-matured vegetables.

Currants fruited freely and a tree of *Pyrus baccata* produced fruit which was harvested September 11.

THE AUTUMN SOWING OF GARDEN SEEDS.

It may interest our readers who are engaged in gardening, especially those living in the cold regions of the Northwest Territories, to hear of a method which has been found advantageous in overcoming the shortness of the season there.

About the first week of October, after the crops have been harvested, the land is prepared for sowing, as in the spring, ploughed or spaded and raked ready to receive the seed. The seed is then sown just before the freeze up. The advantage of this is that the land worked up in the autumn thaws out more quickly in the spring and seeds, slow to germinate, such as carrots, onions and parsnips, being thoroughly moistened by the melting snow, spring up as soon as the frost is out of the ground. There is a difference of from fifteen to eighteen days in germination between seed sown in the fall and in the spring.

REPORT OF EXPERIMENTS ON THE FRUIT FARM OF THOS. A. SHARPE, SALMON ARM, B.C.

The soil on this farm is mostly gravelly loam and, with proper preparation, is excellent for the production of clover and alfalfa, and of suitable varieties of apples, plums, prunes, sour cherries, and all small fruits.

Potatoes were exceptionally good in quality this year.

In 1908, thirty-nine varieties of plums and prunes were planted.

APPLES.

Of the apples, nineteen varieties fruited in 1912; of these, Longfield, Jonathan, Ira and Newtown Pippin fruited freely and are all valuable varieties. The others produced only a few specimens, not sufficient to judge of their quality or productiveness.

There were also fifty-eight varieties of apples planted in the experimental orchard in 1911 and 1912, and nearly thirty varieties either in nursery on the farm or ordered for this spring's planting.

CHERRIES.

Two varieties were planted, Olivet and Planchoury. Both produced good crops of fine fruit, of excellent quality for shipping and canning, as well as for eating out of hand. Two varieties are planted in nursery and about twenty ordered for this spring's planting.

PLUMS AND PRUNES.

All the varieties of plums and prunes fruited.

German prune, Shropshire damson and Primate were the best in quality and productiveness, Purple being a good second. These are all good shippers. Two varieties of Reine Claude fruited, but ripened so late that they are evidently not adapted to this district.

About twelve varieties of plums have been ordered for this season's planting.

PEARS.

There are thirty-eight varieties planted in the orchard, and several sorts in the nursery.

SMALL FRUITS.

Blackberries.—Eldorado, Snyder and Stone's Hardy. These have grown vigourously and fruited well without winter protection.

Red Raspberries.—Cuthbert, Pauline, Columbian and King. These have proved vigourous and fruitful, also without protection.

Grapes.—Saunders' Seedling, Delaware, Brighton and Worden. These were all vigourous growers and ripened their fruit.

Many of the above-mentioned varieties of fruit are selected sorts, got from British and European nurseries for the Experimental Farm at Agassiz, B.C., and proved, on being tested there, to be of sufficient merit to justify the test in the Salmon Arm district.

New varieties of merit will be added as opportunity offers. The annual rainfall in this district is light, but, as there is seldom any frost in the ground during the winter, the melting snows sink into the soil, and this carries the growth well on into June, when, as a rule, there is a fair amount of precipitation in the form of gentle rains. There is, thus, quite sufficient moisture to enable the crops to mature, and a failure has not been recorded for over twenty years. On the uplands there are seldom late spring or early autumn frosts, tomatoes, garden corn, muskmelons and watermelons ripening well.

REPORT OF EXPERIMENTAL WORK AT KAMLOOPS, B.C.

Ten acres of land on the Harper Ranch at Kamloops are retained for experimental purposes by the Department of Agriculture. The Kamloops district is one of very sparse rainfall, and one of the main objects aimed at is the testing of methods of conserving soil moisture and of drought-resistant varieties.

The season of 1912 was exceptional in the amount of precipitation, the snowfall being above the average. The spring was late, and the snow did not disappear until the end of March.

Slight showers of rain fell on five days in April, two days in May, and fairly heavy showers on five days in June, ten days in July, ten days in August. This amount was far above the average for this part of the country.

The fall wheat seemed to have gone through the winter well, except for a few patches where the snow had thawed off quickly and the sun had burnt it up.

On April 4 one acre of the fall wheat was harrowed, but no apparent difference was discernible when harvested. The four acres yielded 1,155 pounds.

The 100 pounds of Red Fife spring wheat and the 2 bushels of O.A.C. No. 21 barley were each sown, on one-acre plots, on May 6, and were harvested on August 13.

The wheat threshed out 900 pounds and the barley 328 pounds; samples of all the grain were sent to Dr. Saunders, Dominion Cerealist, and both the wheats proved to be very good milling samples.

On May 16 the summer-fallow was harrowed. On July 19 and 20 it was skimmed ploughed. On September 27 it was cultivated with a spring-tooth cultivator. On October 15, a bushel and a half each of Kharkov, Turkey Red No. 380 and Girka wheat were sown on half-acre plots which had been summer-fallowed. On October 20 the barley and wheat stubble was ploughed six inches deep.

With regard to the orchard, some of the trees have done extremely well, *e.g.,* Cups of Wine and Red Stettin. Others that have done well and seem to be likely to make good trees are Congo, Pinto, Lowland Raspberry, Walton, Salome and Wendel; also, perhaps, Jonathan.

EXPERIMENTAL STATION FOR THE UPPER COLUMBIA RIVER VALLEY, AT INVERMERE, B.C.

The following is a brief description of the Station at Invermere, with an account of the preliminary work carried on during the year.

SITUATION.

This farm was selected in the summer of 1910, and is located in the centre of the Columbia River valley, midway between the main line of the Canadian Pacific railway on the north and the Crows Nest line on the south. The valley is about 190

miles in length, and from eight to ten miles wide. It is bounded by the Rocky Mountains on the east and by the Selkirk range on the west. The town of Invermere is situated on the western shore of lake Windermere, a beautiful sheet of water, and close to the townsite the farm has been located. It is situated on the first bench, about 150 feet above the level of the lake.

TRANSPORTATION.

In the past, transportation has been difficult. The three summer months, June, July and August, is the only time river navigation can be depended upon. In the warm weather, the ice and snow melt on the mountain ranges, causing the water to rise in the river, but in the spring and fall the water gets so low that the stern-wheeled, flat-bottomed steamers have the greatest difficulty in getting around the short bends and over the many sandbars that impede navigation, especially towards the upper end of the river. However, the Kootenay Central railway is being built from both ends of the valley. It is expected that the steel will soon be laid to Spulmachun, a distance of about forty miles from Golden on the Canadian Pacific railway main line. But this season all passenger traffic has been handled either by steamer or automobile, all summer freight coming by river.

THE FARM.

The farm consists of 53 acres, 35 of which forms a square block, and is adjacent to the townsite of Invermere. The farm has a 66-foot road allowance on three sides. On the east side, its boundary is a 100-foot boulevard. The land has a gentle slope towards the north and east. Near the northwest corner there are several acres somewhat broken, with a number of small gravel ridges. When the land was cleared, a couple of clumps of evergreen trees were preserved from the natural forest. Eighteen acres is divided from the farm by a road; part of it lies on a steep hillside, with a northern slope, and is covered with a growth of small evergreen timber. Several acres are low bottom land covered with a dense growth of poplar underbrush. This low land is only a few feet above the level of Toby creek.

SOIL.

The soil is a sandy loam, from 20 to 24 inches deep. It is an easily worked, friable, warm soil. The subsoil is a porous, open, stony gravel.

IRRIGATION

For the profitable production of crops in ordinary seasons, irrigation has to be resorted to. A plentiful supply of irrigation water can be obtained from the numerous mountain streams. The creek from which the water comes to irrigate the farm is nearly two miles away. Some years ago a ditch was dug to convey water to what is now the Invermere townsite. In some places, sediment has partly filled the ditch in. It will all require to be cleaned out, in some places remade and nearly all the old fluming renewed. However, there is an abundance of water and, as the farm lies lower than the ditch, there should not be very much trouble in applying it to the land.

DOMESTIC WATER SUPPLY.

The town waterworks system extends down the west side of the farm. An inch pipe conveys the water from the corporation main to both house and stable. This furnishes an adequate supply of pure water for both domestic and stable use.

The first Crop on the Experimental Station, Invermere, B.C.

An Experimental Farm in the Rough, Sidney, B. C.

FENCING.

In the month of June the farm was enclosed with a woven wire fence. Fir posts were planted 20 feet apart. Tamarack corner, anchor and gate posts were set four feet deep, securely braced and weighted; wire was firmly stapled to posts. A wide gate provides access to the barn from the west side. Two 10 and two $3\frac{1}{2}$-foot gates give entrance to the house and farm from the east. This makes a strong, substantial fence, nearly five feet high, which is sufficient to turn the most unruly range stock.

BARN.

During the season, a combination barn, stable and granary was built, size 46 x 30, with 20-foot posts. This accommodates four horses, two tied and two loose in boxes, with space in a third box for a couple of cows. The stable is 22 x 30. The drive-in and carriage house is 24 x 30. The second story includes storage room for hay, granary and a commodious sorting room, which has been fitted up and is used as a temporary residence for the foreman.

In the fall of 1911, a contract was let to clear, chop, lop, burn, stump, plough and double-disc 35 acres. This work was finished in the early spring of 1912, and was so well and satisfactorily done that, after the stump holes were filled and the land levelled, a few strokes of the smoothing harrow were sufficient to prepare a fairly good seed-bed.

CROPS.

Twenty-six acres were sown to oats, and seeding was finished on the 12th of May. The crop was harvested in the end of August, was cut a little on the green side, as the straw was required for fodder. Sheaves were set up in round stooks and, though the harvest weather was wet and showery, with re-stooking the crop several days before hauling, and drawing only in the afternoons, both oats and straw were saved in good condition. About 10 acres were seeded to red clover and 4 acres to alfalfa. Although care was used in sowing the nurse crop thin. the young clover plants in the late fall looked rather delicate.

POTATOES.

Nearly two acres were planted with potatoes, with a view to keeping the land in summer tillage preparatory for experimental work next season. However, there was a nice crop of clean, good quality potatoes. After being harvested they were left in temporary pits for two weeks, when they were carefully selected with the aim of saving the very choicest seed for next year's planting.

The potatoes were stored in pits over winter, trenches being dug 3 feet wide, 2 feet deep and 16 feet long. The potatoes were filled in, not quite up to the level of the land, cross pieces of wood were laid across the trench, old lumber was laid on the cross pieces and about 8 inches of earth was piled on the lumber. If the weather got very cold, a few loads of horse manure acted as a protection in zero weather. With a couple of small ventilators on each pit and two or three inches of air space left between the potatoes and the lumber there will not be much danger of the potatoes rotting from over-heating. As last season was extremely wet, raining almost continuously from the latter part of June to the end of August, no irrigation was required.

TEAM AND IMPLEMENTS.

In the end of May a carload was bought and shipped from Calgary, including team of five-year-old horses, weighing 3,000 pounds, harness, wagon, several soil working implements, also hay and feed.

FRUIT TREES.

Early in November, consignments of fruit trees were sent from the Experimental Farm at Ottawa and from the nursery at Grand Forks, B.C. They are heeled in over winter, so as to be ready for planting early next spring.

LAND FOR PLANTING.

About 14 acres on the north side of the farm are ready and in fine shape for next season's planting. It was part in summer-fallow, potato ground and late summer and early fall cultivated stubble land. It is full of moisture, mellow and friable from repeated cultivations with disc and smoothing harrows.

EXPERIMENTAL STATION, SIDNEY, B.C.

Clearing operations were commenced on October 1, 1912. The farm, some 125 acres in extent, was covered with heavy timber, along with some second growth and thick brush, with the exception of a very small portion, which was ready for cultivation.

During the autumn and early winter months, clearing operations were greatly retarded by wet weather, although advantage was taken of every opportunity to push on the work.

SOME COMPARISONS OF METHODS OF CLEARING.

On twenty acres, before attacking the standing timber, the windfalls, trees left by loggers, and brush, were cleared away. This method of clearing proved an expensive one, it being carried on under provincial conditions under which only British subjects (white) were employed, and the wages paid were from 34½ cents to 50 cents per hour, eight hours per day. Teamsters were paid $70 per month and hired teams $6 per day. Twenty acres were cleared ready for the plough at an average cost of $506 per acre.

This cost may be itemized as follows:—

	Per Acre.	Per Cent of Cost.
Slashing, cutting and clearing windfalls, logs, pulling and blowing old stumps and piling and burning same	$215	42¾
Felling, cutting, splitting and piling standing timber, burning same and clearing up ready for plough	163	32¼
Powder, fuse and caps	64	12½
Teaming	52	10
Tools and repairs	12	2¼
	506	100

CLEARING BY CONTRACT.

During February and March, 1913, fifty-four acres were cleared under contracts, the following comparisons being made:—

(1) Twenty acres of swampy ground were cleared with a 40 h.p. donkey engine. The contract price per acre was $350, including engine rental, but the extra burning required cost $20 per acre, and transportation of engine $40. The total cost averaged $398 per acre.

(2) Twenty acres, timbered similarly to the above but with no swamp, were cleared by a practical man with a good crew and teams, at a cost of $338 per acre.

The details of cost are as follows:—

	Per Acre.	Per Cent of Cost.
Slashing, cutting, clearing windfalls, logs, pulling and blowing old stumps, piling and burning same before felling trees	$98	29
Felling, cutting, splitting, piling and burning trees and cleaning up ready for plough	108	32
Powder, fuse, caps	65	20
Teaming	52	15
Tools and repairs	15	4
	338	100

(3) Seven acres of similarly timbered land, with no swamp, but previously slashed: Contract, $260 per acre; total cost of clearing, $240 per acre.

Details as follows:—

	Per Acre.	Per Cent of Cost.
Cutting and clearing windfalls, logs, pulling and blowing old stumps, piling and burning same before felling trees	$40	16
Felling, cutting, splitting, piling and burning same and cleaning up ready for plough	78	32
Powder, fuse, caps	60	24
Teaming	56	23
Tools and repairs	12	5
	246	100

(4) Seven acres, similarly timbered but previously cleared of brush by a forest fire, were cleared at a contract price of $200 per acre. The actual cost per acre was $189, the details of clearing being as follows:—

—	Per acre.	Per cent of Cost.
Slashing, cutting and clearing windfall logs, pulling and blowing old stumps, piling and burning same before felling trees	$25	$13\frac{1}{4}$
Felling, cutting, splitting, piling and burning same and cleaning up ready for plough	58	$30\frac{3}{4}$
Powder, fuse and caps	50	$26\frac{1}{2}$
Teaming	46	$24\frac{1}{2}$
Tools and repairs	10	5
	189	100

(5) Four acres, similarly timbered and cleared of brush by fire, was cleared by a crew of men, stump-puller and team. The average cost was $212 per acre, made up as follows:—

—	Per acre.	Per cent of Cost.
Clearing and burning windfalls, etc.	$25	11¾
Felling, cutting, splitting, piling and burning, clearing ready to plough	58	27
Powder, fuse and caps	50	23½
Teaming	60	28½
Tools and repairs	14	6¾
Cost, stumping machine	5	2½
	212	100

On the 78 acres above reported on, the whole surface was encumbered with heavy windfalls. The standing timber was fairly uniform in quantity and size throughout. Dividing the trees into three classes, according to diameter, the percentage of each per acre would run about as follows. The powder used per acre is also given.

Six to 18 inches diameter, 26 per cent per acre; powder, 10 sticks.

Eighteen to 60 inches diameter, 37 per cent per acre; powder, 20 sticks.

Sixty to 108 inches diameter, 37 per cent per acre; powder, 40 sticks.

In November two trials were made of the char pit system, but owing to heavy rainfall, they were not a success.

Two tests were also made, under similar conditions, on two large stumps, standing side by side to see whether by running a cable from each to a 7-foot stump and tightening it by wedges, the side tension would help in pulling the stump clear of the ground when blown up. Thirty sticks of powder were used under each stump. The results, however, were not as good as when no cable was used.

Four acres of the proposed eight-acre park adjoining the British Columbia Electric Railway Company's station, were cleared of fallen timber, and the ravine, which runs from the highway diagonally through the farm near the British Columbia electric line, was stumped, cleared and the piles burned.

FENCING, ROAD-MAKING AND GRADING.

Owing to a resurvey of the property, the boundary lines were changed, necessitating the pulling up of new wire fence on the north, south and west sides, on each side of the East Saanich road, the British Columbia Electric Railway Company's and the Victoria and Sydney rights-of-way. Fence was also put up along the 42-foot road running through the farm to the water-front. This road gives access to the railway stations as well.

The East Saanich road was widened from 30 feet to 66 feet for 1,310 feet, and was cleaned, levelled and graded. It is fenced with turned posts and Page wire fencing.

A road was made, levelled and graded through the horticultural grounds, 15 feet wide, for 1,000 feet to the western boundary of the Station.

A winding road, 20 feet wide, around and through the eight-acre park was made, levelled and graded ready for traffic. This road passes through some swampy places where it was filled in with stones gathered while clearing the land.

DITCHING AND DRAINING.

January and February were so wet that it was necessary to do some ditching and draining to facilitate clearing the land and getting it ready for the season's crop.

Three thousand feet of ditch was dug to take off surface water and drain swampy land, 4,346 feet of tile of diameters ranging from 3 inches to 24 inches was laid and seventy 24-inch square cedar culverts put in. Two drop wells, 6 feet x 3 feet x 29 feet concreted, were dug to receive laterals. Two wells 7 feet deep x 3 feet diameter lined with brick furnish an abundance of good water for domestic and horticultural requirements.

AGRICULTURE AND HORTICULTURE.

The land on the station is slightly rolling, with a loamy soil, varying in depth from one to several feet. The subsoil is a brick and tile clay, containing 12 to 24 per cent of iron oxide and aluminium oxide.

Fifty acres have been stoned, cleared, levelled, ploughed, harrowed and rolled, ready for crop. It is proposed to devote twenty acres of this to shrubbery, small fruits and vegetables, and the other thirty will be sown to oats, clover and roots. Hot and cold frames are now (March 31) in operation, forcing the seeds for an early planting-out in 200-foot plots.

Plane and dogwood trees will be set out along the 150-foot avenue which extends to the water-front from the East Saanich road, a distance of some 2,810 feet. The clearing, draining, levelling and grading of this road is now well under way.

LIVE STOCK.

Five general-purpose horses have been bought for the farm work. These are all in good condition and working well.

BUILDINGS.

When work on the Station was started in October, 1912, there were some buildings on the property, which have been temporarily adapted for stabling, storing feed and implements, workshop, office, etc.

The commanding location of the Station, the magnificent view of mount Baker, Bazan bay and the straits of Georgia, the uniform elevation running from the water-front to the west boundary with a fairly even seven per cent grade, the variety of soils, the plentiful supply of pure water from natural springs, the even climatic conditions the year round, all make for a future ideal farm.

THE DIVISION OF FIELD HUSBANDRY.

Field crop experimentation which, in the past, has formed a part of the work of a larger Division having to do with both the culture of field crops and the raising of live stock, now constitutes a Division in itself.

Its work is being directed along very practical lines and, as relating to all Experimental Farms and Stations, briefly includes:—

1. Investigations of the relative merits of different crop rotations, including special rotations for 'dry farming' conditions.
2. Studies in the methods of culture of, and curing, field crops. A series of cultural experiments adapted to prairie conditions has now been under way two years on each of the six prairie Farms. These tests involve approximately five hundred plots on each Farm, and include twelve different lines of investigation.
3. Determinations of the costs of growing field crops under regular farm conditions.
4. Experiments to show the value of under-drainage and irrigation.

5. Studies of the influence of size and character of cultural implements on cost of crop production.

6. Comparisons (in a limited way) of varieties of grain and forage crops as food producers.

ROTATIONS.

The most important work at present in progress at the Central Experimental Farm is the testing of rotations considered suitable for live stock farming. During the past year a re-arrangement was made so that there are now permanently located thirteen rotations varying in duration and treatment. They are being studied, keeping in mind the following points of merit:—

1. Their ability to supply different crops in the proper proportions for certain needs.
2. Their power to keep weeds in check.
3. Their comparative profits.
4. Their effect on the fertility of the soil.

Owing to the changed location of many of them, and to the fact that it was not possible to have the regular crops grown in every case, all of the results for the past year are not being published to show comparisons, nor will they be included in averages that will be compiled in later years.

The results to date have not been of such a nature as to warrant making statements as to the relative effect of the various rotations that we have tried on the fertility of the soil. From a summing up of past investigations and results we would, however, submit the following rotations, as having given excellent results here, where the object is to supply suitable kinds of feed in the right proportions for live stock raising.

Rotation 'D.'

This is of three years' duration and is well suited for intensive dairy farming where soiling crops are used.

First year.—Corn or other hoed crop. Apply manure during the winter or spring at the rate of 15 tons per acre, shallow plough in the spring for corn (fall plough for roots) turning under manure and clover, work well before sowing.

Second year.—Grain. Seed down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay, two crops expected.

Rotation 'C.'

An excellent four-year rotation made up of equal areas of hoed crops, grain, hay, pasture.

First year.—Corn or other hoed crop. Plough previous August, manure 20 tons per acre, work at intervals, and ridge up in fall.

Second year.—Grain. Seed down with 10 pounds red clover and 10 pounds to 12 pounds timothy per acre.

Third year.—Clover hay, two crops expected. Second crop may be saved for seed.

Fourth year.—Timothy hay or pasture.

Rotation 'A.'

This is of five years' duration, and contains a relatively larger proportion of grain to roots and hay than 'C.'

First year.—Grain. Plough previous August, top work and rib up in October. Seed down with the grain 10 pounds red clover per acre, which allow to grow to be turned under the following spring.

Second year.—Corn or other hoed crop. Apply manure during the winter or spring at rate of 25 tons per acre, shallow plough in spring, turning under both clover and manure.

Third year.—Grain. Seed down 8 pounds red clover, 2 pounds alsike and 10 pounds timothy per acre.

Fourth year.—Clover hay, two crops expected.

Fifth year.—Timothy hay or pasture.

On some farms no rough pasture is available, and more is required than any of the above rotations supplies. Though it has not been tested here, we might mention the following seven-year rotation as being likely to meet the requirements of such a case:—

Grain, clover hay, pasture, hoed crops, grain, clover hay, pasture.

In view of its long duration it would be preferable to supply the manure in two applications, using part for the hoed crop, and part on the last year pasture in preparation for grain.

If an examination of the above rotations be made, there will be noted a few desirable characteristics common to them all.

1. Grain fields are always seeded down with clover, even though it be used only as a fertilizer, as in the case of the first year of rotation 'A.'

2. Grass and clover seedings are heavy. Increased crops of hay and rare failures of a catch have justified them.

3. Hoed crops form a large proportion of every rotation. An attempt to farm a small area without a hoed crop was not successful. Weeds could not readily be kept in check.

4. No field is left in hay for more than two successive years. Our records show that the second crop almost always costs more per ton than the first and that succeeding crops are very liable to be grown at a loss.

CROP RETURNS 1912.

The table given below shows the costs of producing the various crops grown on the '200-acre farm' (so-called) and the profits therefrom during the past year. In calculating the various items presented, the following values have been used:—

RETURN VALUES.

Oats	$ 0 34	per bushel.
Oat straw	4 00	per ton.
Hay	7 00	"
Corn ensilage	2 00	"
Turnips and mangels	2 00	"
Forage crops (green)	2 00	"
Potatoes	0 50	per bushel.
Swine pasture	15 00	per acre.

COST VALUES.

Manual labour	$ 0 17	per hour.
Horse labour, including teamsters—		
Single horse	0 27	"
2 horse team	0 34	"
3 horse team	0 41	"
4 horse team	0 48	"
Rent	3 00	per acre.
Barnyard manure	1 00	"
Machinery (inclusive of threshing machinery)	0 60	"
Seed oats	1 00	"

Turnip, mangel, corn and potato seed charged at actual cost.
Grass and clover seed charged at actual cost.
Twine charged at actual cost.
Threshing charged according to actual labour expended.

STATEMENT OF CROP RETURNS ON '200-ACRE FARM,' 1912.

Crop.	Area.	Total Cost.	Average Cost per acre.	Average cost per bush. or per ton.	Total Yield.	Average Yield per acre.	Total Value.	Average Value per acre.	Average Profit per acre.	Total Profit.
	Acres.	$ cts.	$ cts.	$ cts.	Lbs.		$ cts.	$ cts.	$ cts.	$ cts.
Oats (including cost of straw)	56·22	862 74	15 35	0 25	115,415	60·38 Bu.	1,154 15	20 53	5 18	291 41
Oat straw	......	....	......	......	147,710	1·31 T.	295 42	5 25	....	295 42
Corn	48·50	1,183 82	24 40	1 51	1,565,820	16·14 T.	1,565 82	32 28	7 88	382 00
Roots (mangels and turnips)	14·78	516 23	34 93	1 50	687,520	23·26 T.	687 52	46 52	11 59	171 29
Potatoes	4·00	251 10	62 77	0 14	106,860	4·45 Bu.	890 50	222 62	159 85	639 40
Green feed (peas and oats)	3·60	65 09	18 08	1 80	72,330	10·05 T.	72 33	20 09	2 01	7 24
Hay	57·22	955 98	16 71	5 52	347,585	3·04 T.	1,216 54	21 26	4 55	260 56
Pig pasture	3·15	39 34	12 49	....	... .	....	47 25	15 00	2 51	7 91
	187·47	3,874 30	20 66	......	....	....	5,929 53	31 63	10 97	2,055 23

NOTE.—A few acres used for cattle pasture and for cutting green and feeding in field where it could not easily be weighed, were calculated on the basis of the average yield of hay for the remainder of the farm.

Owing to the fact that the charges for both horse and manual labour are higher than in previous years, with no corresponding increase in the valuation of the products, the net profits as given above are not so great as last year. A comparison of the value of the returns for the past fourteen years shows, however, very appreciable increases up to the present, and indicates that our system of cultivation and cropping

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is gradually but surely building up the fertility of our soil. Using the same prices throughout, the value of the products of the 200-acre farm per acre were: $14.39 in 1899, $21.30 in 1900, $22.98 in 1901, $24.18 in 1902, $21.61 in 1903, $24.50 in 1904, $29.30 in 1905, $23.23 in 1906, $24.45 in 1907, $23.87 in 1908, $28.51 in 1909, $29.58 in 1910, $27.38 in 1911 and $31.63 in 1912.

PROPOSED EXPERIMENTAL WORK.

In addition to the rotation tests and to the costs-of-production work now under way, it is proposed to inaugurate a series of cultural experiments similar in purpose and outline to those being conducted on our Prairie Farms. In the carrying out of such work we are, however, very greatly handicapped because of the limited area of land at our disposal. The growth of the other Divisions and the establishment of new Divisions have necessitated the concession of small areas from time to time to make possible the new work. We have now, in all, less than two hundred acres on which to carry the stock of the Division of Animal Husbandry, and to conduct experiments, which cannot always be designed to supply the greatest amounts of the kinds of food required. By the use of soiling crops and other intensive methods, we have endeavoured to produce a maximum of feeds. Much further economizing of space through this means is not practicable, however, and I would present for your consideration the need to acquire more land, if the Division is to carry out to best advantage the work for which it was instituted.

ANIMAL HUSBANDRY DIVISION.

At the commencement of the fiscal year of 1912-13, the Animal Husbandry work was made into a Division separate from Field Husbandry, by the splitting up of the former Agricultural Division. Two appointments were made, namely, E. S. Archibald, B.A., B.S.A., as Dominion Animal Husbandman, and G. B. Rothwell, B.S.A., as Assistant Dominion Animal Husbandman. The field of work for this new Division covers directly the care, breeding, feeding, housing and marketing, the testing of foodstuffs, live stock methods and machinery, and much similar investigational work with horses, cattle, sheep and swine on the Central Experimental Farm. In consultation with the Director and the Branch Farm Superintendents, this Division will assist in the same lines of work on the Branch Farms, thus consolidating and systematizing the live stock experimental work.

The year 1912-13 has been most favourable to all classes of live stock on the Central Farm. Grass started early in the spring and, although suffering slightly during the drought of July, yet the copious fall rains induced very heavy after-growth. which afforded excellent pasture. Unfortunately, owing to the shortage of land, only nineteen acres are available for pasturage, which prevents the expansion of the live stock work. However, the Field Husbandry Division supplies a large amount of soiling crops which facilitates fairly extensive animal feeding.

There are 369 head of live stock at present in the stables, made up as follows: 18 horses, 114 pure-bred breeding dairy cattle, 24 grade dairy cattle, 5 beef steers, 57 sheep and 151 swine.

HORSES.

During past years, the horses were kept for labour purposes exclusively, but during the year 1912 a small start was made in breeding work. This is to gather data relating to the cost of colt rearing and the many other phases of the horse industry. That every farmer should do a large amount of this work with brood mares, and raise one or more colts per year, we are convinced is profitable. Data on this subject will be most valuable.

The eighteen horses perform all labour for the Field Husbandry, Horticultural, Cereal, Botanical and other Divisions, as well as road making, messenger service and trucking for the offices. During the past year, the teams performed 6,452 days' labour which, at 70 cents, gives a total valuation of $4,516.40 returns.

No experimental horse feeding was conducted during the past year.

DAIRY CATTLE.

The pure-bred dairy herds now in the stables are Holstein, Ayrshire, Guernsey, French Canadian and Jersey. The purpose of keeping these herds is to acquire more information along the lines of experimental breeding and feeding, to distribute a small number of breeding cattle at reasonable figures, to obtain milk with which to conduct dairy manufacturing and marketing experiments, and to demonstrate the most modern and advisable methods of economic dairy husbandry. Two grade milch cow herds, Holstein and Ayrshire, containing 12 head each, were established during the past year. These cows are kept for several reasons, namely: (1) to supply milk for dairy experimental manufacture; (2) to test the high-quality grade cow for economy of production; (3) to test the grade against the pure-bred cow, and (4) to obtain the female offspring from these cows and sired by the best obtainable pure-bred bulls of the breeds, which should show the advantage of continued and persistent upgrading of the grade herds. This latter experiment is well under way on several branch Farms. Data of such import cannot be acquired too rapidly.

Feeding Dairy Cattle.

The possibility of feeding 138 head of cattle, containing 78 milch cows, on a 200-acre farm which includes only 19 acres of pasture, would scarcely be credited by the average farmer; yet this has been clearly demonstrated, and a wide margin of profit shown. This is made possible only by the use of a large amount of soiling crops, and a heavy acreage of corn for ensilage. Meals are fed to cows during the pasture season as well as in the winter. The profit accruing from meal feeding of milch cows on pasture has been demonstrated beyond a doubt and an increasingly large number of farmers are annually adopting this method.

Several dairy feeding experiments of a more or less extensive nature have been started during the year, but to date there have been but few conclusive results. The value of molasses as a food for dairy cattle is receiving marked prominence from many feed companies. Many farmers are now using either the blackstrap feeding molasses or a patented molasses meal. To gain more data on this subject, a series of experiments was started, the first stage of which pointed to the following facts: (1) When molasses replaces a meal (composed of 6 parts bran, 3 parts gluten meal, 2 parts cottonseed meal, and 2 parts dried brewers' grains) pound for pound to the extent of 10 per cent of total meal fed, it proves quite satisfactory; this is due probably in large measure to the increasing of the palatability of the feed. (2) When molasses replaces the meal to the extent of 20 per cent, the cows dropped in their milk flow and milk cost, to produce, more per hundred pounds; it is worthy of note that on the 20 per cent molasses (1½ to 2 pounds per day) the cows gained in weight and condition. (3) When molasses replaced meal to the extent of 30 per cent, the cows dropped heavily in milk flow and milk cost more per hundred pounds. This quantity of molasses slightly scoured the cows and caused loss in bodily weight. The above is but a brief example of the investigational work being carried on with this and other foodstuffs which are in common use on our Canadian dairy farms.

Milking Machines.

The scarcity of good labour is the greatest problem facing the Canadian dairyman of to-day, and nowhere else in his work as much as in the milking of cows. So

little information on this most important question of dairy labour-saving machinery is at hand that it was considered necessary to install a milking machine with which to conduct a series of experiments, and to acquire these much-needed data for the commercial dairyman. A Sharples Mechanical Milker, consisting of six units, was installed, and during the subsequent eight months much valuable information has been acquired. Although no conclusive evidence has yet been obtained, there are a few facts which, even at this date, are evident. These are briefly as follows: (1) At least 50 per cent of the labour in milking may be saved by the use of the milking machine, but this is partly offset by the extra work in washing and sterilizing the machine twice per day. (2) Scrupulous care must be taken in the cleaning of the machine. As yet, careful hand milking has given milk freer from bacteria, which is due largely to the difficulty of obtaining absolute sterility of the rubber parts of the milking machine without destroying the rubber. (3) The machine performs the milking operation more thoroughly than the majority of average farm hands. (4) Cows take to, and respond well to, the machine, as a rule not drying off in their milk much more than by hand milking. A separate publication covering the details of this work is planned when the experiment has covered a greater period and solutions of the many difficulties, of minor detail, have been achieved.

Dairy Cow Returns.

It is worthy of mention that the quality of the dairy cattle on the Central Farm continues to make improvement. The following is a brief summary, showing returns of some of the cows in the four herds. Profits are based on the following valuations: Butter, 30 cents per pound; skim milk, 20 cents per hundredweight; pasture, $1 per head per month; hay, $7; straw, $4; green feed, $3; and meal, $25 per ton.

No. of head.	Age Years.	Breed.	Days in milk.	Pounds milk production.	Average per cent fat.	Profit over feed between calvings (labour, manure and calf not included).
40	3 and up	Four Breeds.	360	7433	4·15	$65.12
13	2	Four Breeds.	391	5689	4·87	52.98
5	3 and up	Ayrshire.	401	9679	3.96	94.77
5	3 and up	Guernsey.	393	6600	5·15	72.49
5	3 and up	Canadian.	314	6519	4·36	57.32
5	3 and up	Holstein.	403	12425	3·38	96.69

The above figures include only cows which have finished their lactation period, some of the best profit-makers in the herd not being reported. The grade herds also are not included, as they have not yet finished a year's work. Although, in the above, the milk is valued on the basis of butter at 30 cents per pound, or milk at $1.65 per hundred pounds, yet, in reality, the manufacture and sale of cream, Coulommier and Cheddar cheese, certified milk and the like has, on a large part of the milk, netted $3 per hundredweight. The demand for these finished dairy products in all the larger Canadian cities has opened up the possibilities of splendid markets for farmers who are willing to go into the manufacture of the same.

The dairy manufacturing work continues to hold a very prominent position in the work of the Farm, and includes experimental and demonstrational work in the manufacturing and marketing of the above-named products. A new line of work was undertaken during the past year, namely, the production of certified milk. This naturally includes much investigation as to the most economical and perfect procedures both in the stable and in the dairy. In order to secure data that may be regarded as conclusive, this work must be continued for another year before publishing details.

BEEF PRODUCTION.

No breeding cattle of the beef breeds are maintained owing to lack of pasture and stable accommodation. Beef work for the past year has consisted wholly of steer-feeding experiments. Representatives of the Shorthorn, Aberdeen Angus, Hereford, and Galloway breeds, one year of age, were included in this experiment. Although not sufficiently uniform to give conclusive comparative results, yet much information of value was gained. The outstanding feature of this experiment was a demonstration of the fact that long-keep steers, especially with an absence of pasture and with the present high prices of food-stuffs, give but slight, if any, profit.

SHEEP.

The carrying of sheep on the Central Farm is continued under great difficulties. A wide field of investigation and demonstration is opened and in need of prompt attention; nevertheless, with almost no pasture accommodation, such work must remain nearly untouched. Breeding work, on a small scale, is continued with the two breeds, namely Shropshire, representing the medium wool type, and Leicester, representing the long wool type. Probably no class of live stock is in such backward condition or needs such prompt attention from both experimental and demonstrational view-points as sheep. As much work as possible is being conducted on the branch Farms, both in breeding and experimental lamb feeding.

SWINE.

Another most successful year is to be reported for swine husbandry as to net profit, experimental feeding, experimental breeding and the distribution, at a low price, of young, pure-bred breeding animals. Three breeds are maintained, namely, Yorkshire, Tamworth and Berkshire.

Two very useful and interesting feeding experiments conducted during the year are of much importance to the swine industry. In the summer feeding of hogs for market, it was found that green cut clover, when replacing one-quarter of the meal ration, may acquire a food value of $6.20 per ton. In the winter production of pork, much valuable information relating to the comparative values of meal, skim milk and turnips for growing and fattening hogs was acquired. Such experimental work is being continued in order to demonstrate the most advantageous methods of feeding, and the comparative values of the many food-stuffs either raised on the farm or commonly found in our markets.

NEW COW BARN.

It was found necessary to build a small cow barn for the accommodation of 24 milch cows. The object of this building is to have quarters properly equipped both for the carrying on of dairy feeding experiments and experiments in pure milk production. This building also contains a large room to be utilized, co-operatively with the Chemical Division, for the work on digestibility of food-stuffs. Aside from this, the barn represents a good type of complete modern dairy barn construction as to capacity, economy of structure, strength and lightness of framing, durability, con-

venience, light and ventilation; and one in which both healthy cattle and pure milk may be produced. To date, this structure has proven eminently satisfactory. The accompanying illustrations will show its type of structure.

There is now at the Central Experimental Farm probably the most modern and complete system of live stock barns, which represent the best type, that can be found in Canada. Many inquiries as to the details of these buildings are coming to the Animal Husbandry Division, in increasing numbers, from all parts of Canada. In consequence, this Division each year is assisting an increasingly large number of farmers in planning for, either the erection of new, or the remodelling of old, farm buildings. Such work is encouraged as much as possible owing to the fact that the average Canadian farm barn is most undesirable for the maintenance of healthy stock or the economical production of high-quality milk and beef.

The correspondence of this Division includes inquiries from all parts of Canada relating to the many phases of animal husbandry, such as the best known methods of feeding, breeding, care, management, housing and the prevention and treatment of the many minor ailments of all classes of stock. In consequence, a large amount of information is distributed.

The Dominion Animal Husbandman, in attending to his duties outside the Central Experimental Farm, has officially visited each of the Branch Farms on which live stock work is conducted or being planned for. In addition much of his time was taken up in attending meetings in various parts of Canada, judging at numerous exhibitions and in studying live stock conditions and the needs for experimental and demonstrational work relating to the same.

HORTICULTURAL DIVISION.

The Horticultural Division has charge of the orchards, small fruit and vegetable plantations, forest belts and ornamental trees and shrubs on the Central Experimental Farm, and carries on experiments in cultural methods and varieties, in spraying and in the breeding of new fruits, vegetables, and ornamental plants. In addition to the work on the Central Farm as much aid is given as possible on the branch Farms and Stations in developing horticulture.

Much correspondence is carried on by the Horticultural Division with farmers and horticulturists throughout Canada and other countries.

FRUIT AND VEGETABLE CROPS IN CANADA, 1912.

The apple crop in most fruit districts of Canada in 1912 was scarcely a medium one, but in British Columbia it was good. In Eastern Canada, the fruit which was comparatively free of apple scab in the early part of the season, became badly affected in many places in the latter part of the summer, owing, doubtless, to the damp weather. This reduced the grade and the prices, which for the best fruit were relatively low. In Eastern Ontario and the southwestern part of the province of Quebec, the ravages of the Tent Caterpillar lessened the crop very much where the trees were not thoroughly sprayed, and left the latter in bad condition for developing fruit buds for 1913.

Pears were a good crop in the warmer parts of Nova Scotia, but in Ontario the crop was below medium. In the upper part of British Columbia it was good, but rather light in the lower mainland and on Vancouver island. The same notes will apply to the plum crop as to the pear, except that along the lower St. Lawrence, especially in L'Islet county, it was good. A noted feature of the disposal of the plum crop here was that the bulk of it was canned locally and sold co-operatively.

The peach crop in Ontario was a medium to good one, but the prices obtained were not as high as usual. In the Okanagan district of British Columbia, where most of the peaches of that province are produced, the crop of fruit was good, but the prices obtained were low.

The grape, which is one of the most reliable fruits, gave a good average crop in Ontario, where it is mainly grown.

Owing to the cool season almost everywhere in Canada, the tenderer kinds of vegetables, such as tomatoes, melons, squash, etc., did not ripen as well as usual, but those vegetables, the foliage, roots or tubers of which are used, did well.

The potato crop was a particularly good one, nearly everywhere in Canada where it is grown; but, unfortunately, as is often the case when the yield is large, the price obtained was small.

At the Central Experimental Farm the crop of apples was medium to good and very free from scab and Codling Moth. There were a few European plums and a good crop of the American varieties. The cherry crop was almost a total failure, as usual, the flower buds being nearly always injured by winter.

The grape crop was below medium, and the fruit did not ripen as thoroughly as in some years.

The crop of currants, gooseberries, and raspberries was light to medium, and the crop of strawberries good.

The potato crop was very good; tomatoes, below medium and melons light. Most of the other vegetables did well.

DIVISION AND UTILIZATION OF LAND.

The area of land in the Horticultural Division at the Central Experimental Farm is 99 acres, divided as follows:—

Fruits and vegetables	46	acres.
Forest belts	21	"
Ornamental grounds	30	"
Nursery and rose garden	2	"
Total	99	acres.

On this area of land are grown a very large number of plants of tree fruits, small fruits, vegetables, forest trees, and ornamental trees, shrubs and herbaceous plants in more or less permanent plantations, and in nursery rows. The lawns are extensive, and require much care to keep them in good condition. Owing to the large number of experiments in progress, the work involved in giving the necessary attention to them on this ninety-nine acres is very heavy, compared with what it would be on the same area under commercial crops, where the labour could be reduced to a minimum.

The Horticultural Division may at present be divided into five parts, or heads, under which most of the work falls. These are as follows:—

1. Pomology.
2. Vegetable Gardening.
3. Ornamental Gardening.
4. Plant Breeding.
5. Correspondence and Office Work.

In addition to these, or rather included in them, is the work in connection with the branch Farms; the forest belts planted both for ornamental purposes and to test the rate of tree growth; meetings attended, publications and visits to other horticultural districts for the purpose of studying conditions in different parts of Canada.

POMOLOGY.

Under Pomology is included the study of varieties of fruits for the purpose of learning their relative merits in regard to yield, season, quality, and profit. It also includes the identification, classification, and description of fruits as well as their propagation, planting and care, with experiments in cultural methods, including spraying. The exhibition and judging of fruits may be grouped under Pomology.

During the past year, this part of the work has received much attention. Many varieties have been described in detail on cards, which are filed for future referenee and compilation. Varieties which have been sent in for identification have been named and the information sent to the correspondents. Many new varieties have been propagated for test on the Central and Branch Farms, and for trial in other places, and a number of new ones have been planted out at Ottawa.

A Wealthy Apple Orchard Closely Planted.

In 1896, a small orchard of about one-third of an acre was planted with Wealthy apple trees, ten feet apart each way, there being 144 trees in all, or at the rate of 435 trees per acre. Trees have been taken out from time to time until, in 1912, there were 97 remaining. A record has been kept of the cost of caring for this orchard and of the revenue therefrom. The total net profit per acre, 1896-1912 (17 years), has been $1,508.24. The average net profit per acre per year from date of planting is $88.72, and the average net profit per acre per year from date of fruiting, 1899, is $107.73.

Spraying Experiments.

Among experiments in spraying conducted in the Horticultural Division in 1912, was one for the purpose of comparing the relative value of the lime-sulphur wash with Bordeaux mixture in controlling late blight of the potato. The average difference in yield in favour of Bordeaux mixture over nine varieties was 62 bushels 36 pounds per acre.

EXHIBITIONS.

Fruit was exhibited at the Provincial Exhibition, Quebec; the Central Canada Exhibition, Ottawa; and the Annual Meeting of the Society for Horticultural Science, at Cleveland, Ohio. Fruit was also judged at several places by officers of the Horticultural Division.

VEGETABLE GARDENING.

This includes the testing of varieties of vegetables for comparison of their relative merits as regards season, yield, quality, etc.; the comparison of different strains of the same variety; cultural methods, and spraying; and the study of commercial methods of production both in the field and under glass. In 1912, special attention was paid to potatoes, peas, and tomatoes, though all the principal kinds of vegetables were under experiment.

Potatoes.

Thorough spraying with Bordeaux mixture to prevent late blight, and the application of a mixture of 1½ pounds arsenate of lead and 8 ounces of Paris green to 40 gallons of water to control potato beetles, with thorough culture and a good season, ensured a good crop of potatoes in 1912.

Among 136 varieties of potatoes tested in uniform plots in 1912, the following were the most productive twelve, in order of total yield per acre: Dalmeny Hero, 580 bushels 48 pounds; Eureka Extra Early, 563 bushels 12 pounds; Table Talk, 554 bushels 24 pounds; Conquering Hero, 550 bushels; Rochester Rose, 536 bushels 48

pounds; Delaware, 528 bushels; Burpee's Extra Early, 519 bushels 12 pounds; Dalhousie Seedling, 519 bushels 12 pounds; Early Hebron, 514 bushels 48 pounds: Carman No. 1, 510 bushels 24 pounds; Houlton Rose, 501 bushels 36 pounds; Clyde, 499 bushels 24 pounds.

TOMATOES UNDER GLASS.

For the past two winters, a variety test of tomatoes has been conducted in the greenhouse. Taking the results of the two years, the following varieties have given the most satisfactory returns: Industry, Sutton's Satisfaction, Livingston's Globe, Bonny Best, and Winter Beauty.

ORNAMENTAL GARDENING.

Under Ornamental Gardening comes the culture of ornamental trees, shrubs, and herbaceous plants, and the study of their individual characteristics, such as height, form, colouring, and season of bloom, so that information will be available to Canadians to enable them to plant their places in such a way that the trees, shrubs and herbaceous plants will blend or be contrasted with one another to form pleasing landscape effects. The education of the people by lectures and bulletins on ornamental gardening and the encouragement of the beautifying of home surroundings, so much needed in Canada, also received attention during the year. In addition, large collections of roses, irises, phloxes, pæonies, lilacs, gladioli, geraniums and other ornamental plants have been got together for study. There was a fine display of these at the Central Farm in 1912 and visitors were much interested and pleased with the ornamental grounds as a whole.

NOVELTIES OF MERIT TESTED.

Many varieties of annuals were tested in 1912, among these being some novelties of merit: *Alonsoa Warscewiczii compacta* Cosmos Crimson Ray, *Calliopsis Radiata* Golden Ray, *Dimorphotheca aurantiaca* hybrids, *Helianthus Helios, Linaria Maroccana* Excelsior, *Nemesia hybrida* Blue Gem, *Papaver* Danebrog; and *Phlox paniculata* Elizabeth Campbell and *Phlox paniculata* Frau Anton Buchner, perennials.

FOREST BELTS.

The forest belts, planting in which was begun in 1888, furnish interesting data on the relative growth of the different timber trees and the merits of mixing the species or of planting them in blocks of one kind. The annual measurements of a number of trees were taken in 1912, as in previous years.

PLANT BREEDING.

The improvement of fruits, vegetables, and ornamental plants by cross-breeding and selection, and the study of the laws of inheritance in different kinds and varieties of horticultural plants is, in brief, the field of work which is covered in plant breeding in the Horticultural Division. Up to comparatively recent years, Canada has had to depend almost entirely on other countries for her new varieties of fruits, vegetables, and ornamental plants, and, while many of these succeed admirably in this country, it is felt that, if originated in a climate more nearly like where they are to be grown than has been the case in many instances in the past, those that show especial merit are likely to prove more useful than are those introduced from climates very dissimilar. During the past twenty-five years, much attention has been paid to the breeding of horticultural plants at the Central Experimental Farm.

NEW VARIETIES OF APPLES.

Many varieties of apples of handsome appearance and good quality have originated in the Horticultural Division, and the best of these have been sent out for test to different parts of Canada to compare with those already on the market. In 1912 there were 152 varieties of apples originated in the Horticultural Division which fruited for the first time. Of the total of 1,148 new sorts which have fruited, 81 have been named. The following names were given to varieties fruiting in 1912: Ascot, Brisco, Diana, Epsom, Galena, Grover, Humber, Manda, Moreno, Orlando, Pandora, Pedro, Ramona, Rustler, Vermac.

There were some very promising seedlings of Northern Spy apple which fruited in 1912. These show much greater hardiness than Spy while preserving many of the Spy characteristics and, with a fruiting season from autumn to late winter, it is expected that in time some of these will take the place of varieties now on the market.

Cross-bred Varieties of Apples Originated by Dr. Wm. Saunders.

Many varieties of hardy hybrid apples, crosses between the Siberian crab (*Pyrus baccata*) and the apple originated by Dr. Wm. Saunders, have already been introduced into the prairie provinces and have proven hardier than any previously tested there. Second crosses now fruiting which have a larger quota of apple blood have given fruit 2½ inches in diameter and, if they prove sufficiently hardy on the prairies, will be very valuable. Some named in 1912 are: Angus, Elkhorn, Gretna, Trail and Wapella.

New varieties of black currants and raspberries of much merit have been introduced. These were also originated by Dr. Saunders.

Seedling Strawberries.

New and promising varieties of strawberries originated in the Horticultural Division were named in 1912 as follows: Cassandra, Cordelia, Desdemona, Hermia. Julia, Lucetta, Mariana, Miranda, Ophelia, Portia, Silvia, Viola, and Virgilia.

Seedling Plums.

The following names were given to promising new plums in 1912: Corona, Firmana, Hazel, Rhoda, and Vesta.

EARLY STRAINS OF VEGETABLES.

Special attention is being paid to the development of early strains of vegetables which will be of great value in the colder parts of Canada, as well as in the more temperate sections. Good progress was made in this work in 1912, and provision has been made for greater efforts in plant-breeding in the future.

CARD INDEX SYSTEM.

The card index system installed last year in the Horticultural Division for the purpose of filing the records of the Central Farm and branch Farms and Stations has entailed a large amount of work, but is proving very satisfactory.

BRANCH FARMS.

The work of the Horticultural Division in relation to the branch Farms and Stations has grown rapidly. It is its aim to aid the Superintendents in as many ways as possible and to help them develop the horticultural work on the Farms of which they have charge, and also to help to so systematize the work that the results will be

made of the greatest value to the people of Canada. During the past year, much has been done in the directions above mentioned. Material, consisting of plants, seeds, labels, record books and other things have been furnished the branch Farms and Stations through the Horticultural Division, as in previous years. In order to learn what plants and seeds are needed, and to keep the Government in touch with the results of experimental work throughout Canada, the record books of the branch Farms and Stations are sent to the Central Farm each year and what information is needed is copied on cards representing a Central Card Index System, making it easy to learn what is growing at each of the Farms. The Superintendents furnish reports to the Dominion Horticulturist, each week, of the work which has been done so that he may be in a position to answer any questions which may be asked at any time of the year in regard to what is being done in horticulture at the branch Farms.

In 1912, the Dominion Horticulturist visited all the branch Experimental Farms and Stations, some of them more than once, and made plans with the Superintendents for the development of the horticultural work.

Seedling Apples at Prairie Farms.

In the effort to obtain hardy varieties of apples for the prairie provinces, seedling trees of the hardiest Russian apples in addition to the hybrids originated by Dr. Wm. Saunders are now being grown in large numbers, and tested at the six Prairie Farms. The plan is to plant yearlings in nursery rows three feet apart and the plants one foot apart in the row and leave them in these rows until they have gone through two or three winters, when those proving hardy will be transplanted to orchards. In 1912, there were 18,000 of these sent from Ottawa and planted, about 3,000 at each of the six Prairie Farms. Seed of apples fruited in Manitoba has been planted to compare the trees grown from these with those grown at Ottawa of the same varieties. A large quantity of seed was sown in the autumn of 1912, as it is desired to test this method on a large scale.

PLACES VISITED AND MEETINGS ATTENDED.

The Dominion Horticulturist, who was appointed a delegate to the Royal International Horticultural Exhibition held in London, England on May 22-30, 1912, attended this great exhibition, the largest horticultural show ever held in any country. While in England, he visited a number of places to obtain information useful to him in his work. While making his visits to the branch Farms in Canada he took the opportunity of studying conditions in several places and districts in different parts of the West. He made a special inspection of the nurseries in British Columbia.

Some of the more important meetings which the Dominion Horticulturist attended were: The Annual Meeting of the Ontario Fruit Growers' Association, Toronto, Ont.; Annual Meeting of Ontario Horticultural Association, Toronto, Ont.; Annual Meeting of the Niagara Peninsula Fruit Growers' Association, Grimsby, Ont., and St. Catharines, Ont. The Annual Meeting of the Quebec Pomological Society was attended at Macdonald College, Que. At all of these meetings addresses were given. As President of the Society for Horticultural Science, he delivered the Presidential address at the Annual Meeting held at Cleveland, Ohio, on December 31, 1912. The Assistants in the Horticultural Division also attended meetings, delivered addresses, and helped judge at various exhibitions.

THE CEREAL DIVISION.

The season of 1912 was distinctly unfavourable for cereals over almost the whole of Canada. During the early part of the summer drought and intense heat were prevalent; and these conditions were followed by months of wet, cool weather, about as unfavourable for the ripening and harvesting of grain as could well be imagined. Under such conditions, normal crops could not be expected, and the injury done to grain intended for seed purposes was very great. In some districts the heat and drought of early summer caused the young plants of cereals to produce a small number of heads rather prematurely. Later on, when wet weather came, stooling of the plants occurred and a considerable crop of late heads was produced. There was not time, as a rule, for these to ripen; but they grew to a good height and often quite overshadowed the earlier heads; so that when the first heads were ready for harvesting they were almost hidden beneath a mass of green stalks. Under conditions such as these, it was quite impossible to make as accurate observations as usual on the dates of ripening of the various cereals. The yields obtained were also rather misleading, espcially owing to the fact that the early-maturing varieties suffered most, because they were farther advanced when the wet weather set in and were, therefore, less capable of recuperating.

The first severe frosts came rather later in autumn than usual. The results of the season were therefore less disastrous than might have been expected. The quality of the grain was, however, considerably lowered in most districts, while in some localities sprouting of the seed in the stooks occurred to a very serious extent.

Cereal investigations and the propagation of new and approved varieties for distribution and sale could not make very good progress in such an adverse season, but some valuable observations were made, and on some of the Experimental Farms a considerable quantity of seed grain of good germination was harvested.

VISITS TO BRANCH FARMS AND STATIONS.

The eastern Farms were visited by the Dominion Cerealist in July, and those in the west in August and September. The conditions affecting cereals were carefully studied and plans were made, by consultation with the Superintendents, for modifications and improvements in the work whenever such seemed practicable.

At Cap Rouge the very unfavourable, wet spring had been followed almost immediately by hot, dry weather. Under such abnormal conditions the prospects for grain crops were very poor. At Charlottetown and Nappan, the grain was in a much healthier state, and gave promise of reasonably good yields.

Harvesting was in progress—between showers—at the western Farms when these were visited in August. While, for the reasons already explained, the season was an unfavourable one for early-maturing varieties of grain, general satisfaction was found to prevail in regard to the harvest prospects for the early varieties of wheat. Marquis and Prelude. In most instances, the high expectations were fully justified by the weight of grain threshed.

While the varieties of cereals under cultivation in some of the older settled portions of Manitoba and Saskatchewan are satisfactory, and the need of new and improved kinds is not very great, the condition of affairs is quite otherwise in northern districts and over a large portion of Alberta, where the early-maturing varieties of wheat hitherto introduced, including Marquis, can not be depended on to ripen every season, especially when sown on summer-fallow land. For these conditions, Prelude wheat will be of enormous value, but tests of a large number of the new cross-bred sorts produced by the Dominion Cerealist at Ottawa and now available for trial elsewhere should be inaugurated without delay, so that the very best varie-

ties for the various conditions of soil and climate may be discovered. In barley and oats, also, there is need for more extensive variety tests than are possible at present. About a hundred important, new cross-bred barleys are now being tested at Ottawa only, and these should be studied at other points as well.

MARQUIS WHEAT.

Marquis wheat was so fully discussed in the report of last year that a passing reference will be sufficient on this occasion. The year 1912 has been another 'Marquis year,' owing to the conditions being rather unfavourable for the growing of Red Fife. Not only did Marquis give yields which, as usual, surpassed Red Fife, on the great majority of farms, but the winning of the highest award at the International Dry-Farming Congress at Lethbridge last autumn again attracted the attention of the whole world to this variety. Marquis is now being grown by so many farmers in almost all parts of the western country that there has been no difficulty in securing good seed this winter. While any attempt to estimate the probable acreage of Marquis for the coming season will probably be quite inaccurate, it appears that at least one million acres of this variety will be sown. The widespread popularity of Marquis is all the more noteworthy when we recall that this variety was introduced into Saskatchewan in 1907, when about half a bushel of seed was sent from Ottawa for trial on the Experimental Farm at Indian Head. Almost the whole of the seed now in the farmers' hands traces back to that first shipment, very little seed grown at Ottawa having since been sent out.

Many excellent yields of Marquis wheat were reported last season, the most remarkable being on the Indian Head Farm, where a plot of one-fortieth of an acre gave a crop at the rate of over 81 bushels per acre. This is probably a world's record for spring wheat.

PRELUDE WHEAT.

Preliminary tests at Ottawa and at some of the branch Experimental Farms having clearly demonstrated the great value of this new variety, a few small samples were sent last spring to farmers in Saskatchewan and Alberta, so that a better idea might be obtained as to its adaptability to various districts. The tests on the branch Farms were also increased in number and in acreage. The season was particularly unfavourable for varieties which develop rapidly, because excessive heat and drought prevailed during the early part of the summer, conditions which proved very trying to all grains which were moderately well advanced. Those sorts which develop slowly were not so seriously injured. In one or two cases, small plots of Prelude wheat were almost entirely destroyed during this dry period; but, on the whole, the record made by the new variety was most satisfactory, the yields in some instances being really remarkable.

Two special cases deserve mention. Mr. E. B. Cay, of Beatty (near Melfort), Sask., sowed five pounds of Prelude wheat on one-fifth of an acre of land and threshed 603 pounds. Mr. W. J. Borton, of Bottrel, Alberta, sowed one pound of seed on a relatively large piece of land and secured 123 pounds of clean grain. Of course in this case the wheat did not ripen so early as it would have done had it been sown more thickly. One would not advise such extremely thin seeding under ordinary circumstances, but it is perhaps justifiable when only a very small quantity of seed can be obtained, and when its value is (as in the present instance) quite beyond any ordinary scale of prices.

The conclusions to be drawn from the experience of this past season confirm those of previous years. Prelude wheat can be unhesitatingly recommended as the best variety available for districts where extreme earliness is necessary and where there is a tendency toward the production of long straw. For dry districts, where straw is apt to be short, Prelude cannot be recommended. The Dominion Cerealist hopes to intro-

duce a very early-maturing sort in the near future which, though not quite so early in ripening as Prelude, will produce somewhat longer straw. A very early-maturing wheat with decidedly long straw may perhaps be an impossibility.

The regular distribution of Prelude wheat in five-pound samples was commenced this winter. As there was on hand only a very small stock of seed, compared with the amount asked for, it was necessary to refuse most of the applications which were received, especially those from districts where the need of this particular variety was not so very great. More than 200 samples were sent out, chiefly to northern localities in what may be roughly described as the settled areas of Saskatchewan and Alberta. Provision has been made for a good acreage of Prelude on the Experimental Farms this season, so that there may be a large stock for distribution, and perhaps some seed for sale also, next winter.

DISTRIBUTION OF SEED GRAIN BY MAIL.

The annual free distribution of seed grain and potatoes, which is now in progress, is being carried on in a manner similar to that of the previous year. The grain for distribution was grown chiefly on the Experimental Farms at Indian Head and Brandon. Some Ottawa seed is also being used and the stock of potatoes has been obtained entirely from a field grown on the Central Experimental Farm under the supervision of the Dominion Botanist. In spite of the unfavourable character of the season, both the yield and quality of these potatoes were unusually good.

All grain for distribution is grown with the greatest care, so as to be free from admixture with other varieties. After threshing, it is thoroughly cleaned by the best obtainable grain-cleaning machinery and, finally, it is hand-picked, if necessary, to remove any remaining impurities. By these precautions, it is possible to send out seed of the very highest type, distinctly superior, as a rule, to the best commercial stocks. While the adoption of so high a standard makes it impossible to distribute as large amounts as in years gone by, there is no doubt of the advantages of the present system. Reasonable regulations are now being enforced so that samples of seed are sent only to those applicants whose requests give evidence of some thought. Those who have failed to send a report on a sample received in a previous season are not eligible for further samples. Considering its inherent difficulties, the claim may fairly be made that this distribution is now managed in such a way as to give general satisfaction. Undoubtedly it is proving of immense value to Canada.

The principal varieties distributed this season are as follows:—

Spring Wheat.—Marquis, Red Fife, White Fife, Huron, Prelude.

Barley.—Manchurian (6-row), Canadian Thorpe (2-row).

Oats.—Banner, Abundance, Ligowo, Daubeney.

Peas.—Arthur, Golden Vine.

Potatoes.—Irish Cobbler, Gold Coin, Carman No. 1, Delaware.

MILLING AND BAKING TESTS.

An extensive series of milling and baking tests has been carried on during the past winter. These have included many new cross-bred varieties produced at Ottawa by the Dominion Cerealist, and some of the standard, old varieties as well. The samples tested were chiefly grown at Ottawa, last season, but samples from some of the branch Experimental Farms were included, as it is important to study the variations which occur in baking qualities when varieties of wheat are grown under different conditions.

Attention is being given to problems in connection with the making of bread, both from a baker's point of view and a housekeeper's; and the laboratory is now prepared to investigate any cases of contaminated, spoiled or suspicious flour which may be submitted.

No detailed report of the tests of this winter will be made at present, as it is intended to publish a bulletin on this subject as soon as practicable, giving an account of most of the work which has been done along these lines for several years.

EXPERIMENTS WITH VARIETIES OF GRAIN AT OTTAWA.

On the Central Experimental Farm, last season, there were grown four principal series of plots:—

1. Very small plots of unfixed types produced in the second and later generations from cross-bred seeds.

2. Small propagation plots in which the new cross-bred sorts which have shown themselves to be fixed in character are increased until enough seed is available for a plot of one-sixtieth of an acre. A few named (commercial) sorts are also grown in these plots, as well as selected strains from named varieties (commercial or otherwise).

3. The regular series of plots of one-sixtieth of an acre each, in which the comparative tests of varieties are carried on.

4. Larger plots of varying size where those varieties which have given evidence of special merit are propagated on as large a scale as the limited amount of land (and sometimes of seed) permits. Seed from the best of these plots is sent to the branch Experimental Farms the following year for more extended trial.

The following figures will give an idea of the extent of this work, last season, at Ottawa:—

Very small plots of cross-bred sorts, not yet fixed	470
Small propagation plots	201
Plots of one-sixtieth of an acre	434
Larger propagation plots	45
Total plots	1,150

There were grown at Ottawa, last season, the following numbers of varieties of wheat, emmer, oats, barley, peas, rye, beans and flax:—

New cross-bred varieties, under numbers	426
Cross-bred varieties, named	38
Selected strains from commercial sorts	83
Commercial sorts, unselected	58
Total varieties and selections	605

The above figures would have been somewhat larger if there had been enough land available for the Cereal Division to make possible the sowing of all the varieties which were on hand. Unfortunately, a large number of barley plots had to be omitted on account of the shortage of land.

In view of the great amount of material which is being studied, it should be explained that the object in view is to test a multitude of varieties and finally though rejecting almost all of them, to retain everything which has shown outstanding merit.

To the public, there will be introduced only a few of the very best sorts. The great disadvantage of introducing too many varieties for the use of the farming community is fully recognized, and any such error is being carefully guarded against. Very short lists of varieties recommended for cultivation in the different provinces are published from time to time, for the guidance of farmers.

CROSS-BREEDING AND SELECTING CEREALS AT OTTAWA.

Cross-breeding and selection have been continued as in other years. An interesting new beardless barley called 'Arlington Awnless,' which has recently been introduced by the Department of Agriculture at Washington, furnished an opportunity of making some promising new crosses for the production of still better beardless sorts. Crosses were also made last summer between Marquis and Prelude wheats, for the purpose of combining, as far as possible, the splendid qualities of these two varieties. Other crosses in wheat and oats, were effected.

The amount of material now on hand is very great, but it is felt that some new crosses should be made from time to time, so that Canada may not lose the high position she now holds by the remarkably successful efforts which have been made here for the improvement of cereals.

DIVISION OF CHEMISTRY.

As heretofore, the work of the Chemical Division, under the superintendence of Mr. F. J. Shutt, Dominion Chemist and Assistant Director, has been carried forward with a two-fold purpose—the prosecution of research which might lead to the solution of problems in Canadian agriculture, general and specialized, and the more immediate and direct education and assistance of the individual farmer in matters pertaining to his every-day work. Though spoken of here, for the sake of clearness and convenience, as distinct classes of work, there is, at times, no sharp line of demarcation to be drawn between them. One frequently prompts and assists the other and thus it is, that many investigations of wide importance have been taken in hand as the result of information or suggestion contained in a correspondent's appeal for help. Much of the most fruitful and timely work, yielding results of an essentially practical and widely useful character, has been the outcome of efforts to obtain the data necessary to enable one judiciously to advise the farmer in his difficulty.

Naturally, no detailed account can be given in the report of the year's activities in this branch of the work, which seeks directly to advise and inform the farmer through correspondence. It must, therefore, suffice to say that the endeavour has been made to make the Division a Bureau of Information in matters relating to the Chemistry of Agriculture, to which all may apply, and that there is a steadily increasing number of those who are sending in questions having reference to the economical maintenance and increase of soil fertility, the nature and amounts of plant-food constituents in manures and fertilizers, the special requirements of crops and farm animals, the relative nutritive values of forage crops and feeding stuffs, the composition of dairy products, the constitution and preparation of insecticides and fungicides, and a host of allied subjects in general and specialized farming that call for chemical aid. The experience of twenty-five years has shown this work of answering inquiries and reporting on samples sent in by farmers to be most useful, giving help when and where it is wanted to those who will benefit by it. It has proved very popular and it is thought. successful in disseminating knowledge to those on the farm and further, has won for the reports and bulletins of the Farms many interested and earnest readers. This educational work necessarily occupies a considerable portion of the time of the Chief of the Division.

A classified list of samples received for examination from farmers and of those in connection with the various investigations that have been carried on during the year, is presented in the following table. The total number, 2,821, exceeds that of the previous year by nearly 500, and of 1911 by over 1,000, a fair indication of the increasing appreciation on the part of farmers of this branch of the work.

SAMPLES Received for Examination and Report for the Twelve Months ended March 31, 1913.

Samples.	British Columbia.	Alberta.	Saskatchewan.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.
Soils	53	601	485	456	52	59	29	27	13	1,778
Muds, mucks and marls	1	.....	.....	1	......	3	2	2	8	17
Manures and fertilizers	5	4	......	1	12	41	6	12	1	82
Forage plants and fodders	14	38	16	6	127	20	7	6	17	251
Waters	51	23	24	7	215	30	25	8	3	386
Miscellaneous, including dairy products, preservatives, fungicides, insecticides, etc	19	7	10	7	225	26	11	2	....	307
	143	676	535	478	631	179	80	57	42	2,821

CONSERVATION OF SOIL MOISTURE.

This important investigation was begun in 1910, with the object of ascertaining the influence of various cultural operations and croppings on the moisture-content of the soil. It comprises a series of cultural and rotation experiments conducted on the Experimental Farms at Brandon, Man., Indian Head, Sask., and Lethbridge, Alta., planned and arranged to include a number of systems of tillage, soil management and crop rotation likely to prove suitable for farming in the open prairie districts enjoying but a sparse and irregular rainfall. Soil samples from the experimental plots have been taken to two depths—0 to 18 inches, and 18 inches to 5 feet, periodically throughout the season, and their moisture-content determined.

It will be understood that this work is still in progress and, therefore, that final conclusions must be deferred. It will be possible, however, to indicate some of the more striking results that have been obtained.

In 'prairie breaking' the plots were ploughed from 2 to 5 inches. In two seasons of the three the soil of the deeper ploughed plots, for the first 18 inches, retained the more moisture. Though the difference usually was small, it was fairly well maintained throughout the summer, the surface of the plots being kept well cultivated. It was found that adjacent plots of recently broken land, sown, after due and similar preparation by discing and harrowing, to a mixture of peas and oats and flax respectively, differed considerably in their moisture-content as the season advanced. That bearing the peas and oats was the more moist, probably owing to the greater protection against surface evaporation provided by the more leafy crop.

The influence on moisture-content of 'depth and time of ploughing' was determined on a large number of plots. As regards depth, the ploughing varied from 3 to 8 inches, with an additional subsoiling of 4 to 6 inches on certain of the plots. The times of ploughing were one month apart, in May, June and July. The trend of the results from two seasons' records is in the direction of greater moisture storage following the deeper ploughing, but evidently there is a limit—probably deter-

mined by the nature of the soil—beyond which the stirring of the soil by the plough does not appreciably affect the moisture-content or, at all events, cannot be done profitably.

Earliness in ploughing has shown itself conducive to moisture storage in a most marked degree. The delay of a few weeks has resulted in a decidedly lower moisture-content throughout the rest of the season.

In 'subsoil packing' the data show a well-marked advantage for light and sandy loams, but that there was little extra conservation of moisture from this operation on heavy clay loams.

INFLUENCE OF ENVIRONMENT ON THE COMPOSITION OF WHEAT AND BARLEY.

This research, inaugurated in 1905, and continued since that date, has shown that soil and seasonal conditions may markedly affect the composition of wheat and barley. For the past three years, wheat from the same stock has been grown on the larger number of Experimental Farms and Stations from Prince Edward Island to British Columbia, and the harvested grain analyzed. The data obtained in a very large measure confirm those of previous seasons from similar experiments conducted in the northwestern provinces only, and go to show that a moderately dry soil, accompanied by high temperatures during the period in which the grain is filling, tend to arrest the vegetative growth of the plant, to hasten maturity and conduce to a hard berry, with a high percentage of gluten and high baking value. It would seem from this investigation that the excellent quality of northwestern-grown wheat is due in part, at least, to climatic conditions which prevail during the later summer months over large areas in the grain-growing districts, and which bring about a quick maturation of the grain.

The results, as regards protein (gluten), from the examination of the 1912 crop are of considerable interest in showing the variations that may occur in one season's growth at points across the Dominion.

PROTEIN in Marquis Wheat Crop of 1912 (calculated on water-free basis).

Laboratory No.	Locality grown.	Protein (N x 5.7)
11209	Parent Seed, Indian Head, Sask. 1911	14.62
13923	Charlottetown, P.E.I	12.50
13162	Nappan, N.S	13 29
13288	Cap Rouge, Que	14.96
13008	Ottawa, Ont	16.81
13173	Brandon, Man	17.21
13146	Indian Head, Sask	17.02
13596	Rosthern, Sask	17.17
13174	Scott, Sask	18.10
13939	Lethbridge, Alta., irrigated	16.32
12842	" " non-irrigated	17.93
13166	Lacombe, Alta	18 09
13680	Agassiz, B C	14.77

As an illustration of the principle cited, that available soil moisture influences the protein-content, attention may be directed to the data from Lethbridge, Alta. The soil on the non-irrigated plot was found to be from 2 per cent to 4 per cent drier during June, July and August than that of the irrigated plot, and the wheat from the drier soil proved, on analysis, to be the richer in protein by 1.61 per cent.

FODDERS AND FEEDING STUFFS.

These, for the most part, comprise the milling by-products and manufactured feeds used in experimental work with stock on the Central Farm, Ottawa. The list, however, contains a number of materials of feeding value sent in by farmers but not coming within the jurisdiction of the Inland Revenue Department, the branch of the Government service undertaking the official analysis of feeding stuffs on the market. The list comprises middlings, shorts, feed flour, and mixed meals from oats and barley, of bean and rice meals, of molasses feeds of various kinds, dried grains from the brewery and distillery, tankage, etc., etc.

The composition of feeds is a matter well worthy of study by farmers and dairymen, and especially so in these days of high prices. There are many concentrates on the market that, with judicious feeding, can give good value, and these are not necessarily low-priced goods—indeed they are more frequently those bringing a good figure per ton but which, nevertheless, are worth it by reason of their high protein and fat-content. There are also many inferior feeds which may almost be said to be dear at any price. Such, for instance, are many of the oat feeds, largely made of the refuse from oatmeal and cereal food mills, which contain little protein and fat and are overloaded with indigestible fibre which is not only useless but depresses the value of the other nutrients. These feeds, possibly largely oat hulls, find buyers at $10 to $15 per ton, when bran is selling for not more than $20. There is no economy in such practice. Again, there are certain manufactured feeds against which no complaint can be raised as to wholesomeness, but for which extravagant claims are made and extravagant prices are charged. In this class are some of the molasses feeds, certain brands of which are sold much above their value, when their prices are compared with staple milling products. The price of the feed is not an infallible guide to its nutritive value, and the purchaser, when not familiar with the material, would do well to look for the guarantee as to protein and fat-content.

THE RELATIVE VALUE OF FIELD ROOTS.

Twenty-three varieties of mangels, grown on the Central Farm, were submitted to analysis, and very considerable differences in nutritive value were noticed. In dry matter, they ranged from 13·38 per cent to 7·87 per cent and in sugar, from 9·15 per cent to 4·75 per cent. The sugar mangels, the Mammoth Long Red and the Giant Yellow Intermediate, headed the list, the poorer members of the series comprising several varieties of the Yellow Globe mangel. Though not an invariable rule, those containing the larger percentages of dry matter were the richer in sugar, the chief constituent of value from the nutritive standpoint. The averages for the whole series were 9·51 per cent dry matter and 6·43 per cent sugar.

Two well-known and typical varieties, Gate Post and Giant Yellow, grown side by side at Ottawa annually for 13 years, have been analyzed to ascertain the influence of heredity on composition. Though the differences between them have not been constant throughout this period, the Gate Post has invariably proved the superior root. The averages for the experimental period are: Gate Post, dry matter, 11·53 per cent, sugar, 6·16 per cent; for the Giant Yellow Globe, dry matter, 9·52 per cent, sugar, 4·56 per cent.

Nineteen varieties of turnips were submitted to analysis. Considerable differences as regards dry matter were found, as in the case of mangels, but the sugar-content was fairly constant. Turnips, as a class, are not so rich in dry matter as are mangels, and possess a much lower sugar-content. The best turnip in the series was Carter's Prize Winner, with 10·55 per cent dry matter and 1·25 sugar, closely followed by Hartley's Bronze Top, Kangaroo and Best of All. The limits for the series in dry matter were 10·55 per cent and 5·85 per cent, and the average 8·65 per cent.

Carrots, judging from their composition, are intermediate in food value between mangels and turnips. Six of the prominent varieties were analyzed, and the differences between them, either in dry matter or in sugar, are small compared with those noted for other field roots. The first on the list is Giant White Vosges, with 11·45 per cent dry matter and 2·83 per cent sugar. The remaining varieties follow in close order, and the averages for the series are 10·50 per cent dry matter and 2·54 per cent of sugar. This crop it has been noticed, varies but slightly as to composition from year to year; evidently, it is not influenced by seasonal conditions to the same degree as are mangels and turnips.

SUGAR BEETS FOR FACTORY PURPOSES.

Three varieties of sugar beets—Vilmorin's Improved A, Vilmorin's Improved B, and Klein Wanzleben—have been tested on ten of the Experimental Farms and Stations. The seed was obtained from Messrs. Vilmorin, Andrieux et Cie., Paris, who are recognized as among the foremost firms in Europe for high quality sugar beet seed.

A survey of the whole series shows remarkably satisfactory results; in the larger number of instances, the beets were exceptionally good, and in one or two cases only—due to unfavourable weather conditions—could the roots be accounted too poor for profitable sugar extraction. Averaging the results from the three varieties tested at each Farm, the highest sugar-content was obtained at Lethbridge, Alta., on the non-irrigated plot (17·68 per cent) and the lowest at Brandon, Man., (13·40 per cent). At three Farms in the series, the average sugar-content was above 17 per cent and at three others between 15 per cent and 17 per cent. It has been conclusively shown from this investigation, which has been carried on systematically since 1901, that beets suitable for factory purposes can be grown at widely distant points in the Dominion.

FERTILIZING MATERIALS.

These include naturally-occurring materials and certain by-products of agricultural value by reason of the plant food they possess. Those analyzed and reported on during the year include marl and similar calcareous deposits, ground limestone, agricultural limestone—a product from lime-kilns—gypsum or land plaster, wood-ashes, river, marsh and mussel muds, lobster refuse from the packing houses, dog-fish scrap, a potash residue from the oxygen-acetylene plant and several other products of fertilizing value.

Without inserting analytical data—which space forbids—it would be impossible here intelligently to discuss the agricultural importance of all these varied materials. The reader must, therefore, refer to the annual report of the Division of Chemistry where they are considered in detail and their uses indicated. It must suffice to say that many of them can be very cheaply obtained and will be found of value in improving tilth and in supplying notable amounts of plant food. Some of these are of the nature of amendments, others may be ranked with commercial fertilizers, and all may be employed, as conditions dictate, as aids to the maintenance and increase of soil fertility.

INSECTICIDES AND FUNGICIDES.

The more important materials of this nature examined during the year are included in the following list: Formaldehyde, copper-sulphate, agricultural bluestone, carbolized wheat protector, apterite, lime-sulphur wash, potassium cyanide and lead arsenate.

Only one sample of formaldehyde was found below standard strength. The results generally show that the manufacturers are putting out an article of very fairly uniform strength and one in conformity with the guarantee.

Of the samples of bluestone submitted, two were found to contain notable percentages of sulphate of iron; they were, in fact, 'agricultural bluestone' being sold for bluestone, which is sulphate of copper.

Agricultural bluestone is the name given to a crystalline mixture of sulphate of copper and sulphate of iron. For the treatment of wheat it is distinctly inferior in fungicidal properties to bluestone proper and for the preparation of Bordeaux mixture it is useless. Readers are cautioned against buying it.

Carbolized wheat protector is a preparation found to consist essentially of sulphate of iron and crude carbolic acid. Its efficiency for the prevention of smut in grain is extremely doubtful.

Apterite is a compound described as a 'soil fumigant and fertilizer.' It is essentially a mixture of sulphides of lime (probably gas lime) with naphthalene. Experience in Canada with similar preparations is as yet limited, but such as there is has not been very favourable.

Five brands of lime-sulphur sold in Canada have been analyzed, the sulphide sulphur ranging from 21·87 per cent to 25·09 per cent, amounts that may be considered satisfactory. The larger number of lime-sulphur washes put on the market by reputable firms have been found of good quality.

Potassium cyanide, when obtained in sealed original containers, has proved of guaranteed strength. The chemical rapidly deteriorates on exposure, so that samples taken from open bottles are frequently of inferior quality.

Very considerable differences in lead arsenate content have been found to exist amoung the various brands of this insecticide upon the market, and results obtained here point to the desirability of compelling the manufacturer to give a guarantee on the label of the package, stating the percentage of arsenate of lead present.

THE FERTILIZING VALUE OF RAIN AND SNOW.

The total precipitation, as recorded at the Central Experimental Farm, Ottawa, for the year ending February 29, 1913, was 39·36 inches, 9·62 inches falling in the form of snow. Analysis showed that this furnished 6·144 pounds of nitrogen, per acre, in forms readily available for crop use. Records taken here indicate that the proportions of this amount furnished respectively by the rain and the snow, have not appreciably varied for the past four years, about eight-tenths of the nitrogen compounds being found in the rain.

THE WATER-SUPPLY OF FARM HOMESTEADS.

Of the 386 waters sent in during the year from various parts of the Dominion. 188 have been submitted to complete sanitary analysis. Of these, 89 were pronounced as pure and wholesome, 43 as suspicious and probably dangerous, 41 as severely contaminated and 15 as too saline to be used as a potable supply.

The worst waters were from shallow wells dug in barnyards, or in the neighbourhood of similar sources of pollution. These merely draw upon the ground water in their immediate vicinity and must become, by reason of their location, contaminated. The abandonment of such wells is strongly advocated. The bored, or driven well, obtaining its supply from a deep-seated source, and below one or more strata of impervious rock, has, as a rule, yielded good water. Both as to quantity and quality, the bored well is more satisfactory than the 'hole in the ground' so commonly found in the country. It is gratifying to note that such wells are now replacing the old form of supply on many Canadian farms.

MISCELLANEOUS.

The work of the year has also included the analysis of 185 samples for the Meat Inspection Division, Department of Agriculture. These were collected at the various packing houses in Canada and included lards, preserved meats, dye stuffs and colouring matters, preservatives, pickling solutions, spices and condiments, etc., etc. This examination is made with a view of determining their nature, purity and character of adulteration, if present.

Samples of water from Coquitlam lake, B.C., the source of the supply for the city of New Westminster, and where a large dam is being constructed, have been examined monthly for the Water Power Branch, Department of the Interior, for which Branch, also, a number of mechanical analyses of 'fill' used in dam construction in different parts of the Dominion have been made.

For the Dominion Parks Branch, Department of the Interior, a report has been made monthly on the water supply used at Banff, Alta. Analyses show this to be a water of exceptional purity.

Analyses of a number of natural waters have been made at the request of the Department of Marine and Fisheries, with a view to determining if certain alleged pollution might be such as to affect fish life or lessen their value in hatchery operations. Also, as for many years past, reports have been made on the composition of dogfish scrap produced at the Government Reduction Works in the Maritime Provinces.

DIVISION OF FORAGE PLANTS.

The desirability of a closer study of those plants useful as food for stock has become more and more evident from year to year. Until 1909, experimental work with forage plants constituted part of the work of the Division of Entomology and Botany, under the late Dr. James Fletcher. After his death, separate Divisions of Entomology and of Botany were formed. That part of forage plant investigation dealing with the families of grasses and leguminous plants was taken over by the latter Division, while the study of field roots and Indian corn was carried on by the Cereal Division.

In 1912, it was felt that the growing need of wider experimental work, looking both to the testing of present varieties and to the originating of new and improved sorts, demanded the creation of a Division of Forage Plants, under the charge of a specialist in this line of work. Accordingly, all forage plant investigational work was placed in the hands of Dr. M. O. Malte, a brief account of whose career appears elsewhere in this report.

The farm plants coming within the scope of the work of this Division are:—

1. Field roots.
2. Indian corn.
3. Leguminous plants.
4. Grasses.

In addition to these groups of forage plants, some experiments with broom corn are also being conducted by the Division.

FIELD ROOTS.

The work with field roots, including turnips, mangels, carrots and sugar beets, was continued along the lines followed in the immediately preceding years, *i. e.*, it consisted chiefly in the testing of different varieties as to yielding power.

Of turnips (including swedes), nineteen varieties were tested, the highest yielding variety being Best of All, with a crop of 40 tons 1,634 pounds per acre.

Of mangels, twenty-three varieties were tested. The highest yielding varieties were four of the Yellow Globe type, which averaged 42 tons, 1,368 pounds per acre. The other nineteen varieties yielded a much smaller crop, their average being 26 tons, 313 pounds per acre.

Of carrots, six varieties were grown, their average yield being 18 tons, 545 pounds per acre.

Of sugar beets, three varieties were tested, the average yield being 15 tons, 1,978 pounds to the acre.

INDIAN CORN.

Of Indian corn, twelve varieties were tested, yielding an average of 16 tons, 1,700 pounds to the acre. The very wet weather during the first part of June, and the unfavourable conditions during practically the entire season had, on the whole, quite a disturbing effect on the results of the experiments.

CLOVER, ALFALFA AND GRASSES.

The year's work with leguminous forage plants and grasses consisted chiefly, save for comparative testing of the yield of those 'varieties' which were already growing in the experimental field, in starting the breeding of new varieties and strains from old, long-tried species.

As is well known, the production of new varieties and strains can be accomplished by following three main courses, viz.:—

1. *Line Breeding, i.e.,* breeding from individual parent plants by means of self-fertilization.
2. *Mass-Selection,* by which production of new so-called varieties is effected by raising parent plants, selected *en masse.*
3. *Hybridization,* by which new strains are produced by combining desirable characters of two parent plants into one individual.

Whether Line Breeding, Mass-Selection or Hybridization should be used for the production of new varieties and strains depends largely upon two factors, viz.: (1) the way in which the plants worked with can be fertilized, and (2) what kinds of character the breeder wants to develop.

The influence of the ways of fertilization on the breeding methods to be employed can be demonstrated by the following two examples:—

1. A Timothy plant growing among other individuals of its kin is apt to be cross-fertilized, and there is no doubt that the bulk of the timothy seed produced in the field is the result of cross-fertilization. A timothy plant isolated in such a way that pollen from other individuals has no chance whatever to reach its pistils, can be fertilized by its own pollen and produce seed of good quality.

2. A Red Clover plant is always fertilized by insects carrying pollen from one flower to another. If a red clover plant is isolated so that it cannot be visited by insects, it will not produce a single seed. What is of more importance in this connection is, however, the fact that red clover is perfectly self-sterile, *i.e.,* a flower of a certain individual cannot be fertilized by pollen developed by that individual. Every red clover seed produced is therefore the result of a cross-fertilization between two individual plants.

This clearly understood, it is evident that Line Breeding of red clover is entirely out of question. The method to be employed must be mass-selection or hybridization.

Whether Mass-Selection or Line Breeding should be used as a basis for breeding work depends also upon what results are looked for.

When the aim is to secure uniform strains distinguished by certain constant morphological characters, Line Breeding is practically the only safe method to use.

When, however, certain physiological or biological characters are looked for, mass-selection can be used to advantage.

RED CLOVER.

Red Clover, being a self-sterile plant, new varieties and strains must be produced by means of mass-selection and hybridization respectively.

When breeding red clover, three qualities particularly should be taken into consideration, viz.: winter-hardiness, quality of seed, and yield of hay.

It has been proven in cereals which, like red clover, consist of thousands of distinct types, that resistance to disease and hardiness are hereditary characters subjected to the same general laws of heredity as govern the transmission from a mother-plant to its progeny, of strictly morphological characters. It is therefore very reasonable to suspect that winter hardiness in red clover is a hereditary character that can be transmitted from one parent plant to its progeny.

If this be the case, it will be a simple matter to produce a variety able to withstand, without being killed to any extent, the most severe Canadian winter. The task could be accomplished by sowing seed from those individuals which survive after a severe winter and which, therefore, according to our conception, represent hardy 'lines' or strains. After sowing the seed thus saved, a progeny may be expected that will prove hardier than was the parent crop originally sown, and by saving the seed year after year, a perfectly hardy variety will soon be obtained. This method of improving the hardiness is simply mass-selection effected by nature herself.

With this aim in mind, seed was saved during the summer of 1912 from all plots of red clover except two, the intention being to use it for the production of hardier varieties.

In order to produce, by means of artificial crossings, red clover strains of high yielding power and with seed of a desirable type, seed collected from a number of individual plants during 1911 was sown in hills two feet apart each way. Several unfavourable factors, however, prevented most of the seed sown from germinating and developing properly.

TIMOTHY.

Timothy being able to produce seed when self-fertilized as well as when cross-fertilized, all three breeding methods referred to above can be used.

What should be especially looked for in timothy breeding is the production of constant strains of superior yielding power. Such strains can hardly be secured except by a phenomenal chance of luck by mass-selection. Line breeding must be considered the safest if not the only way.

In order to secure material for line breeding of timothy, seeds collected from a number of wild plants were selected. Of the seedlings obtained, about 1,200 were planted in the field 3 feet apart each way. The further development of these plants will decide how many of them will be selected as mother plants for production of new strains.

Similar steps have been taken, although on a much smaller scale, to secure material for breeding work with orchard grass and with certain other forage plants.

THE DIVISION OF ENTOMOLOGY.

THE ADMINISTRATION OF THE DESTRUCTIVE INSECT AND PEST ACT.

This includes the inspection and fumigation of imported nursery stock and the field and laboratory work against the Brown-tail Moth. The new arrangement whereby this Department and the Department of Agriculture of British Columbia co-operate in the work of inspection and fumigation of imported nursery stock at Vancouver, B.C., has worked most satisfactorily. As indicating the importance of our inspection of imported plants may be mentioned the discovery by an inspector at Vancouver during the inspection last spring of eight egg-masses of the Gipsy Moth in an evergreen (*Thuja*) from Japan. From these egg-masses several hundred larvæ of the Gipsy Moth emerged. During the importation season of 1911-12, over 3,800,000 trees and plants were inspected. Owing to the danger of the importation of the Mediterranean Fruit Fly (*Ceratitis capitata*) from the Hawaiian Islands, the importation of all non-canned fruit from those islands was prohibited by the passing, in April, 1912, of Regulation No. 16 under the Act. In December, 1912, Regulation No. 17 was passed requiring a certificate of inspection to accompany all forest plant products originating in those of the New England States which are infested with the Gipsy Moth and imported into Canada. The importation of coniferous trees and Christmas greenery from the same states was also prohibited by the same regulation.

As recorded in the last annual report of this Division, the area infested with the Brown-tail Moth in New Brunswick was found to have increased very considerably. In 1911, as a result of our discovery that the Brown-tail Moth had spread from the state of Maine into New Brunswick, a thorough scout was made and in the spring of that year the infested area was found to be approximately 400 square miles. During the summer of 1911, the Brown-tail Moths apparently invaded the province to so great an extent that during the winter inspection of 1911-12 it was found that the infested area consisted of about 6,400 square miles. The light character of the latter infestation may be gathered from the fact that only 2,452 winter webs were collected. In Nova Scotia, the infestation was found during the inspection season 1911-12 to have spread a few miles farther eastward and a larger number of winter webs were collected; 7,503 webs were gathered, compared with 4,490 during the previous season.

FIELD LABORATORIES.

In 1911, by the courtesy of the Department of Agriculture of Ontario, a field laboratory was provided at Jordan Harbour, Ont. During the past season the field work of the Division was extended by the provision of small portable buildings in Nova Scotia, New Brunswick and Quebec and by the provision of temporary quarters in western Ontario and British Columbia. The following is a brief resumé of the field work which was started in connection with these laboratories. In Nova Scotia, Mr. G. E. Sanders commenced an important series of investigations on the life-history and control of the Bud Moth. An orchard of ten acres was placed at the disposal of the Division, for spraying experiments, by Mr. Ralph Eaton, of Kentville, N.S. Concurrent studies were commenced on the Green Fruit Worm (*Xylina spp*) now becoming a serious pest in some orchards. Results have already been obtained which would indicate that it will be possible to recommend a system of spraying which will control these insects and at the same time render unnecessary some of the applications now employed.

The work carried on by Mr. J. D. Tothill at the New Brunswick field laboratory located at Fredericton, N.B., consisted chiefly in the importation and colonization of two of the most important enemies of the Brown-tail and Gipsy Moths, namely, the predaceous beetle *Calosoma sycophanta* and the tachinid fly parasite *Compsilura concinnata*. Supplies of these were collected, thanks to the courtesy of Dr. Howard,

Chief Entomologist of the United States Department of Agriculture, in Massachusetts, into which state they had been imported from Europe. Considerable numbers of the beetles were reared and two colonies were placed out and went into hibernation. Two strong colonies of the tachinid parasite *Compsilura* were placed in the field, and before the close of the season it was found that individuals from one of these had spread three miles from the point of colonization and had parasitized the native Fall Webworm (*Hyphantria textor*), a most encouraging result. The parasites of certain of the more serious native pests are being studied.

In Quebec, a field laboratory is located at Covey Hill, south of Montreal, in an orchard seriously infested with the more common species of apple insects. Here, Mr. C. E. Petch, during the latter half of the summer, commenced an investigation on the Apple Curculio (*Anthonomus quadrigibbus*) and also made observations on the Apple Maggot (*Rhagoletis pomonella*). At the laboratory at Jordan Harbour, Ont., and at Bowmanville, Ont., Mr. W. A. Ross continued his studies on the Apple Maggot. While the wet season militated somewhat against the carrying out of all the work which had been outlined, important results, which will prove of practical value, were obtained and it is hoped that a third season will complete this thorough investigation.

Owing to an outbreak of the Chinch bug (*Blissus leucopterus*) in Middlesex County, Ont., Mr. H. F. Hudson was sent to the centre of the infested district where he investigated the outbreak and the possibilities of control measures. Although serious damage had been inflicted in places, the insect does not appear to be spreading rapidly and investigations will be continued during the coming year, when White Grubs (*Lachnosterna*), which are causing serious and widespread damage, will also be studied.

Temporary quarters were furnished for entomological work in British Columbia at Hatzic, in the Fraser valley, and here Mr. R. C. Treherne commenced an investigation on the Strawberry Root Weevil (*Otiorhyncus ovatus*). An excellent beginning was made on a study of the life-history of the species and a number of experiments were carried out with a view of discovering practicable methods of control. The rotation of strawberry beds associated with proper cultural methods appears to be at present the most satisfactory method. A visit was made by Mr. Treherne to the States of Oregon and Washington for the purpose of studying this and other insects which are common in the Pacific Coast region. A permanent laboratory has now been erected on the Experimental Farm at Agassiz, and this will serve as headquarters for the work in British Columbia.

The extension of our work into the field by the establishment of field laboratories, of which a brief outline of the work carried on during the first season has been given above, has not only rendered possible the inception of really valuable investigations on certain of the more serious insect pests and their control, but in many other ways has enabled the Entomological Division to reach a larger number of people to whom its work can be of service. As representatives of the Division, its field officers have been able to advise farmers and fruit growers and carry on an educational campaign which, if persisted in, must prove of incalculable benefit.

INSECTS AFFECTING FIELD CROPS.

The serious outbreak of cutworms in Southern Alberta was inquired into. It was found that between thirty and forty thousand acres of grain had been destroyed in the neighbourhood of Lethbridge. As the methods of control which were recommended appeared to be ineffectual and as the chief injurious species (*Porosagrotis delorata* Sm.) had not been previously recorded or studied, arrangements have been made to carry out a thorough investigation during the coming year.

The experiments on the control of the Root Maggots were continued and the results, on the whole, confirmed those of the previous years as to the superiority of

the tarred-felt paper discs for cabbages and cauliflowers, and hellebore decoction and screening the beds for radishes and onions. It is hoped that the results of the three years' work will be ready shortly for publication.

INSECTS AFFECTING FRUIT TREES.

Reference has already been made to the work on fruit insects which has been carried on at the different field stations. A very important result of the work in Nova Scotia was the discovery by Mr. G. E. Sanders of the presence of living San José scale, which had been brought into the province on nursery stock imported from Ontario. Assistance was given the provincial Government in the inspection of nursery stock which had been imported during the last three years, and a considerable number of trees infested with living scale were found.

The work on the Indian orchards for the Department of Indian Affairs was continued, and a full account of this will be published in the annual report of that Department.

INSECTS AFFECTING FOREST AND SHADE TREES.

The appointment of Mr. J. M. Swaine to have charge of the forest insect investigations has permitted of the very considerable extension of the work in this most important direction. During the year he has visited the Riding Mountain Forest Reserve, Man., Algonquin Park, Ont., and one or two districts in Quebec and, as a result, has collected a large amount of material and information which will be of great service in connection with future work.

A shipment was obtained of the cocoons of the Large Larch Sawfly infested with the useful parasite (*Mesoleius tenthredinis*) from the English Lake district and these were distributed by Mr. Swaine in Manitoba in the Riding Mountain Reserve. It is hoped to receive a further supply of parasitized cocoons from England this spring.

INSECTS AFFECTING DOMESTIC ANIMALS AND MAN.

An investigation was made into the distribution of the Rocky Mountain Spotted Fever Tick (*Dermacentor venustus*) in western Canada. A large number of ticks belonging to several species were received, and it was found that *D. venustus* was fairly common in southern British Columbia and also occurred in southern Alberta. Observations were also made on the life history of this species.

On account of the discovery by Drs. Sheppard, Rosenaw, Brues and Anderson that the Stable Fly (*Stomaxys calcitrans*) could transmit the virus of Poliomyelitis (infantile paralysis), investigations on the life-history and habits of this insect were resumed and some interesting and valuable data have already been obtained. The campaign against the house fly was continued, and it is gratifying to record the appreciation with which efforts in this direction are met.

INSECTS AFFECTING GARDEN AND GREENHOUSE.

Experiments have been carried out and are still in progress on the control of White flies (*Aleyrodes*) by fumigation, and on the control of wood lice, or sowbugs, all of which are serious pests in some greenhouses.

APICULTURE.

In view of the further extension of this work, consequent upon the appointment of Mr. F. W. L. Sladen as Assistant Entomologist to take charge, a beginning was made by the importation of pure Italian queens from Bologna, Italy. It is planned

to carry on queen-rearing work and varietal studies. Experiments were also commenced on the outdoor wintering of bees, twelve colonies being placed in large wooden cases specially constructed to contain four hives each.

MISCELLANEOUS.

The correspondence for all parts of the Dominion relating to the identification of insect pests and requesting advice as to methods of control has increased considerably. The field officers of the Division are already rendering useful service in their respective regions in the matter of advising farmers and fruit growers in regard to the control of insect pests. An increasing number of collections of insects have been named for individuals and educational institutions. A collection of insects is being arranged in the Division, the various officers being responsible for certain orders. An exhibit of injurious and beneficial insects and their work was arranged for the Dominion Exhibition held at Ottawa.

Visits have been made to various provinces for the purposes of giving addresses and organizing the field work. In May, the Dominion Entomologist visited Nova Scotia, New Brunswick and Massachusetts in connection with the field laboratories in those provinces and the Brown-tail Moth campaign.

The International Congress of Entomology, held at Oxford, England, was attended from August 6 to 10, and on August 12 he attended a conference called by the Secretary of State for the Colonies at the Colonial Office to work out a scheme for Imperial co-operation in preventing the spread and furthering the investigation of insect pests. This conference, and a previous conference held in June, 1911, have resulted in the establishment of the Imperial Bureau of Entomology, to which reference is made later. Lectures and addresses have been given at Halifax, St. John, N.B., Toronto, Winnipeg, etc. In February a visit was made to North Portal, Sask., and Winnipeg. Mr. Gibson lectured on the control of fruit pests at a short course held at Charlottetown, P.E.I., in January, and has addressed other meetings. As already stated, Mr. Swaine has visited certain provinces, studying forest insect depredations. Mr. Sladen conducted a short course in apiculture at the Nova Scotia Agricultural College in January, and subsequently studied apicultural conditions in Nova Scotia and New Brunswick. By these and similar means, the Division has been enabled to extend its energies over a large field.

IMPERIAL BUREAU OF ENTOMOLOGY.

An Imperial Bureau of Entomology has been instituted in connection with the Colonial Office, and it has been decided to co-operate in its maintenance. Its chief function will be that of an intelligence bureau. In this connection, information will be collected from all parts of the world concerning injurious insects and the plants, or animals, which they attack. A journal, *The Review of Applied Entomology*, is also being published, and this contains summaries of current literature relating to injurious insects and their control. The Bureau will also undertake the identification of insects. As a means of co-ordinating the work of preventing the spread and furthering the investigation of injurious insects within the Empire, the Bureau will undoubtedly prove of considerable service.

THE DIVISION OF BOTANY.

The work of this Division has been partly new and partly continued along the same lines as last year.

INSPECTORS UNDER THE DESTRUCTIVE INSECT AND PEST ACT.

An extensive inspection of potatoes and potato crops was carried on. The following inspectors acted for longer or shorter periods of time: Messrs. Sydney Dash, Hugh H. Lindesay, Herbert Groh, B.S.A., P. Lavoie, Rolph Holmden and H. Selwyn. As the work terminated in the different localities, the services of the inspectors were dispensed with, and at present only two remain to finish the work and start a new campaign towards planting time.

CORRESPONDENCE.

The correspondence is one of the principal features of the advisory work of the Division, and takes up considerable time; the number of letters received and despatched steadily increases, amounting for the year of report to 2,107 letters received and 2,531 sent out, or nearly double the number dealt with the year previous. Correspondence is the means by which the Experimental Farms are kept in closest contact with the farmers and fruit-growers of the Dominion, and although among the inquiries received there are, naturally, many relating to the same subjects, yet much useful information is often gained from this source on the distribution of weeds and plant diseases; furthermore, by these means, new problems have frequently been brought to our attention.

This year, some one thousand plants and weeds were identified, and information given as requested by their senders. A large number of inquiries dealt with diseases of economic plants, and the remainder were of a miscellaneous and executive character.

INVESTIGATIONS.

(*a*) *Grain Diseases.*

Smut Diseases of Grain.—The great importance of the diseases of grain and related crops caused by smut fungi, necessitated close attention to the study of certain phases of the life-history of these destructive organisms, and the control of such diseases. Since the organization of the plant pathological work of this Division, special attention has been paid to this problem. These investigations have now been concluded, and a bulletin (No. 73) has been prepared.

Studies of the Discolouration of Wheat Grains.—From time to time there have been received samples of wheat showing a shrivelling of the grain, accompanied by a more or less brownish discolouration. In some cases large samples submitted showed as many as 17 per cent grains discoloured. On germination, the young plant developed fairly well at first, but soon the rootlets began to decay before the food supply of the grain became exhausted. A considerable series of fungi appeared and were isolated; while some of them may be of secondary nature and harmless, yet they appeared fairly constantly, and experiments are being carried on to test their relation to the discolouration. At present, fungi like *Cladosporium, Macrosporium, Hormodendron, Epicoccum, Septoria Heterosporium* were observed, and pure cultures of them will be used for infection experiments. In some instances, the discoloured grains caused a sample to appear off colour, and in others the germination was found to be poor. In case fungi or bacteria are found to be capable of injuring grain in this manner, a careful study is necessary to prevent serious consequences, as such discoloured grain can hardly be classed as the best grade.

Injuries to the Young, Growing Wheat.—During the last two years, samples of young grain, particularly fall-sown grain, have been sent from the West, which are either completely destroyed or which will not produce strong plants. These injuries may be the result of severe winters or of certain fungous diseases.

The production of grain—the foremost industry of the Dominion—should be carefully guarded from any destructive diseases, and a considerable amount of close study is yet required to explain the various matters referred to.

(*b*) *Diseases of the Potato.*

Potato Scab.—The question of potato scab and its control has engaged a large number of investigators throughout the countries where potatoes are grown. Although taken up from almost every aspect, this universal disease is by no means under control. It is the general experience that certain methods of treatment may prove successful in some years, occasionally for some years in succession, and yet in other years prove of practically no value. Although potato scab cannot be classed among the destructive diseases, yet it causes a very objectionable appearance in badly-infected tubers. During the last season, a set of experiments was carried on in Prince Edward Island on some infested land kindly placed at the disposal of the Division by Dr. Andrew MacPhail, himself a successful potato grower, but, notwithstanding every care, none of the efforts made proved of any value. The experiments will be continued, some features observed indicating the desirability of certain new lines of inquiry being followed up. Meanwhile, the use of sound tubers and the proper disinfection of them, and the selection of land which has preferably not been used for potatoes before, or at any rate which has not borne a scabby crop, seem the only rules which afford any safeguard.

Rhizoctonia Disease.—This is another disease affecting the plant through the tuber. The disease-causing organism, while known, has not yet been well studied. There are still important biological features concerning it of which we know little, and further researches are necessary. In any disease where the soil serves as a medium of propagation, there exist serious difficulties in the way of a lasting control. At any rate, our present means of soil sterilization are practically useless, and rotation does not effect the desired purpose.

Storage Rots.—The rotting of potatoes when placed in storage has been very considerable during this year. During their investigations the inspectors examined some 20,000 bushels, or more, of stored potatoes, and found on the average a loss amounting to 15 per cent; in some single instances over 30 per cent loss was found due to this cause. The question of the control of storage rots involves careful study of a large number of common diseases affecting the growing plant, and, incidentally, the tuber; further, mechanical injuries when digging potatoes, frost, and last, but not least, the conditions under which the tubers are being stored, are closely concerned in producing storage losses. While it is generally correct to suggest that storage losses will be considerably reduced when these latter factors are eliminated, yet it will be realized that the problem as a whole cannot be satisfactorily solved as long as we fail to control the various diseases and causes themselves.

(*c*) *Diseases affecting Fruit.*

Silver Leaf.—Much progress has been made in the study of this disease. Curiously enough, the fruit-growers are still somewhat slow to recognize its true nature. It is one of the slowly-developing, slow-killing diseases as yet little known by its symptoms,

and hence regarded with indifference. Yet when it is stated that in one orchard, situated in one of the most important fruit-growing centres of British Columbia, 94·15 per cent of Northern Spy, 31 per cent of Wealthy, and, in another, 90 per cent of Spy, 6 per cent of Jonathan, 12 per cent of McIntosh, were found affected, and further, that the disease prevails more or less in almost every fruit-growing district of the Dominion—with the exception of the Niagara peninsula—and further that it attacks most of the important fruit trees and bush fruits, it should be realized that a dangerous disease is being permitted to spread unchecked. It has been already demonstrated in experiments here what causes the disease and how to prevent it from spreading; there are, however, still some factors to be studied before definite results can be published.

Fire or Pear Blight.—This disease has been very prevalent in orchards in British Columbia, where it assumed an epidemic character this summer. From an examination of a number of orchards, it was found that the disease had been present for some years in the form of so-called 'hold-over cankers,' which had been considered by some as due to winter injury or anthracnose. They were left unheeded, and the favourable climatic conditions of last season caused them to produce a serious outbreak which has lost some growers many trees. Constant cutting out of the 'hold-over cankers,' with the appearance of which every fruit-grower should make himself familiar, would greatly reduce the chances of early infection, and, if supplemented by immediate and proper pruning out and destruction of attacked shoots, would prevent the disease from becoming epidemic.

The usual number of inquiries were dealt with concerning the control of scab, anthracnose and other more common diseases.

Diseases of the grape, strawberry, currant, raspberry and almost all other kinds of fruit were studied, and advice given.

Storage Rots or Storage Defects of Fruits.—As with potatoes, there occur rots and injuries on stored fruits, and from just as many causes. Black Rot, Bitter Rot, Pink Rot, Core Rot, may be mentioned among the parasitic injuries. Physiological rots, showing a discolouration of the skin, spotting of the tissues below the lenticels, and others due to 'sweating' or sudden changes of temperature, etc., are also prevalent. Here again considerable work needs to be done, but it appears difficult to convince fruit-growers that such diseases or affections cannot be controlled without interfering to a greater or less degree with their general routine and practice. The practice in vogue, however, when it can be clearly shown to result in such consequences, can hardly be considered of the best.

EXPERIMENTAL WORK.

(a) *Potato Growing.*

At the request of the Director, the Division of Botany carried on an experiment in growing potatoes with the purpose, as stated in the instructions, to produce 'as large and as profitable a crop as possible; free from disease, or as free from disease as possible under conditions such as exist in Canada to-day.' As the production of 'large and profitable crops' is not a question of freedom from diseases alone, Mr. D. D. Gray, Farm Foreman, who had had considerable experience in raising potatoes, undertook the practical side of the experiment. The season may be described as an exceptional one. The very late spring, the cool weather after planting, the frequent and heavy showers throughout the year, which latter largely interfered with successful sprayings, did not forbode the best results. However, the land was very suitable and well prepared, and by close attention to cultivation and spraying, the potatoes, after once starting to grow, looked quite promising. One acre each of the following four varieties of potatoes was grown:—

Carman No. 1, Early Delaware, Irish Cobbler, Gold Coin. The following surprisingly satisfactory yields were obtained:—

	Bush.
Carman No. 1	444·41
Irish Cobbler	455·83
Early Delaware	471·33
Gold Coin	411·48

The potatoes themselves looked very well, they were a good size, not too large and appeared fairly sound, although, notwithstanding regular spraying, potato blight appeared late in July, and the tops were to some extent affected. In seasons with less rainfall, no doubt the results would have been even better as regards freedom from blight. One of the principal features was the failure in rapidly controlling the Colorado Beetle, and it is probable that the control of this pest would have considerably reduced blight infection. The experiment will be repeated for some two or three years more, when the details, cost of production, manner of treatment, etc., may be dealt with in a special bulletin. It may be stated that these potatoes also suffered much from storage rots.

(b) Inquiry into the Sources of Bacteria in Milk Produced at the Farm.

This work occupied a considerable portion of the time of the Division. At the beginning of the experiment, the Dominion Botanist, at the suggestion of the Director, gave a series of six demonstration lectures before the men engaged in dairy work on the Farm, in order to familiarize them with the necessary precautions and the reasons for exercising them at all times. The question was taken up from every point of view, and included the testing of milk obtained by machine milking *vs.* hand milking. It may, however, be said that, with the exercise of constant care and diligence and interest taken in all operations by all parties concerned, there has been produced at the Farm, after nearly ten months' work, milk with as low a bacterial count per cubic centimetre as 200, which may be claimed to be among the lowest in bacterial content of any naturally-produced, untreated milk anywhere.

ST. CATHARINES FIELD LABORATORY.

This laboratory was established for the study of plant diseases in the Niagara district, and was opened August 1, 1912. In the thorough investigation of diseases occurring in certain districts climatically or otherwise different from those at the Central Experimental Farm, serious difficulties were experienced, so that it was thought best to place a laboratory in the orchard rather than to try to bring the orchard into the laboratory. We have found that this move met with the greatest appreciation of the fruit-growers in this district, and Mr. McCubbin, a very competent officer, reports well of the progress of this work. Throughout the season, a study of the local conditions was carried on, Mr. McCubbin attending and addressing many meetings held in that district. Among the diseases specially taken up may be mentioned the peach tree canker already referred to in previous reports; a new disease in currants due to one of the higher fungi (*Polyporus ribes*); Mosaic disease of tomatoes which appears to spread, and others. Careful attention is being paid to the control of peach yellows and 'little peach' and some work begun by the Dominion Botanist in this connection has given interesting results and important clues. The officer in charge of this laboratory also acts as an inspector under the Destructive Insect and Pest Act.

ADMINISTRATION OF THE DESTRUCTIVE INSECT AND PEST ACT.

Every possible care is being taken by the responsible officers of the Division to prevent the introduction of plant diseases new to the Dominion, and the spreading of such as are scheduled under the Act.

BOTANIC GARDENS.

The work in the Botanic Gardens and Arboretum made the usual annual progress. A large number of plant and tree labels were placed out. Seeds of many herbaceous plants, trees and shrubs were collected and exchanged with other Botanic Gardens.

COLLECTIONS.

The scientific collections were considerably increased. Mr. Eastham devoted as much time as he could spare to collecting and classifying fungi, and especially Canadian *Myxomycetes*. Miss Fyles is engaged in a study of the types of wild rice, and has also collected material for the gardens and herbarium. Every officer of the Division does his part to increase the various collections by personal efforts, in order to make them as complete and, consequently, as valuable as possible for reference purposes. Thanks are due the many correspondents who have contributed to these collections, but special thanks should be given the Bureau of Plant Industry, United States Department of Agriculture, for their courtesy in contributing some 574 specimens of dried (mainly microscopic) fungi to the herbarium. Through such generous contributions, and by systematic exchange, our collections continue to grow in a very satisfactory way.

TRAVELLING AND ADDRESSES, PUBLICATIONS, ETC.

The Dominion Botanist visited the Niagara district several times during the season in connection with the work of the field laboratory. Addresses were given before the Fruit-Growers' Association in St. Catharines and Grimsby on various topics of local interest. In August, and part of September, a visit was paid to the western provinces, where arrangements had been made to meet fruit-growers in the recently-started fruit plantations of the Kootenay valley. Observations were also made on the spreading or presence of a number of fruit and grain diseases which had been under investigation. Mr. Eastham was in charge of experiments conducted in Prince Edward Island concerning potato scab, the results of which are given in full elsewhere, and he was also away from the Central Laboratory inquiring into the source of an outbreak of powdery scab in the province of Alberta; later in the year he was authorized to attend the Cleveland meeting of the American Association for the Advancement of Science.

During the year, members of the staff of the Division were asked to attend and address various meetings, associations and congresses. Among others, papers relating to 'Legislation against plant diseases' (read before the International Horticultural Congress, London, Eng.), 'International Control of fungus diseases' (read at the meeting of the American Association for the Advancement of Science, in Cleveland), etc., were presented. A number of official publications have been issued, and minor papers and articles were published in scientific and agricultural journals.

THE POULTRY DIVISION.

Year by year, the poultry branch of farm work is becoming more and more valuable to the farmers of Canada and the indifference formerly displayed to poultry-keeping is gradually disappearing. The possibilities of profit from poultry, properly cared for, have been clearly demonstrated in the Poultry Division on the Central Experimental Farm, and have been fully reported on from year to year. When the products, eggs and chickens, are marketed at the proper seasons, that is, when the general supply is least and prices highest, each hen should show a profit of from one dollar to one dollar and fifty cents per annum. Many farmers who attend carefully to

their flocks of fowls, clear a much larger margin than this. Where pure-bred fowls of a good strain are kept, the sale of eggs for hatching adds materially to the income.

In order to obtain the advantages of having both eggs and chickens for sale, it is necessary either to keep two breeds, one for egg-production, such as the White Leghorn, Minorca, Ancona or Black Minorca, and one of the large, heavy breeds as a flesh-producer, or (2) the endeavour may be made to find a breed uniting in itself the characteristics of both to a marked degree. For the average farmer's purpose, the latter alternative is much to be preferred, as it relieves him of a great deal of extra labour.

From experimental work carried on here for many years, any of the following may be confidently recommended as a 'dual purpose' breed: Barred and White Plymouth Rocks, White Wyandottes, Rhode Island Reds, Orpingtons and Dorkings.

It has been a common practice in the past to attempt to secure flesh-forming and egg-laying characteristics by mating a bird of the former type with one of the latter. The resulting crosses have proven very unsatisfactory and it cannot be too strongly recommended that, whatever breed or type of fowl the farmer may choose, he keep nothing but pure-breds. The sale of breeding stock and of eggs for hatching, to say nothing of the greater returns in other ways, will more than repay him for his care in keeping his flock pure-bred.

There is little danger of the over-production of poultry and eggs in Canada for many years to come, if ever. Up to the present, in spite of increased production and decreased export, prices have steadily increased. As a matter of fact, Canada has, for the past two years, imported many hundreds of thousands of eggs. The field for greater home production is practically unlimited. In this production, however, the Canadian farmer's motto should be 'Quality.' It is the first quality, both of eggs and of chickens, which commands prices ensuring the maximum profits. The unsuitability of type and lack of finish of much of the poultry now marketed in Canada has frequently been commented on by our heaviest buyers.

With eggs, equal care and attention are necessary. They should be gathered regularly and frequently, packed in attractive shape and marketed without delay. The hens should be well and cleanly fed and both hens and houses kept free from lice and mites. The houses should be comfortable and adapted to the climate of the locality. Plans of various styles of houses will be furnished free by applying to the Poultry Division, Central Experimental Farm, Ottawa.

Whether for the production of table fowl or for laying and breeding stock, the necessary care and proper feeding should commence from the time of hatching. Chickens compelled to hunt continually for food are retarded and stunted in growth and develop sinew at the expense of flesh. It should not be forgotten at any stage that it is the production of the highest quality that should be aimed at and that care and good feeding are the requisites for success.

The production of eggs in winter is a problem, the solution of which is dependent on several factors, such as comfortable quarters and proper food, time of hatching and time of moulting. In order to be early winter layers, the hens should moult in midsummer and should be fully feathered out by the end of October. It has been shown that the progeny of hens which moulted in midsummer have a tendency to do the same. The possibility has also been demonstrated of controlling the moulting season by variations in the rate of feeding and in the food supplied.

Pullets, especially of the dual purpose breeds, in order to be early winter layers, should be hatched out not later than the first week in May. Both cockerels and pullets should be bred from parents of a good egg-laying strain.

Where hens have been laying regularly during the winter, a difficulty likely to be met with in early spring is that of weak germs, which are apt to hatch out, if they hatch at all, in the shape of weakling chickens, which usually die from acute indigestion or bowel trouble. It is far better to wait before setting hens or filling the

incubator, until the breeding stock has had an opportunity of running outside after the snow has gone, usually about the end of March. By so doing, the birds have an opportunity of recovering from their long confinement during the winter. Another advantage is that the chickens will hatch out when the weather is genial and the grass growing rapidly.

It is a mistake, however, to postpone hatching operations too long, as late-hatched pullets are non-productive during the period of highest prices, the early winter months.

A great deal of study and experimental work has been devoted to the preservation of eggs laid in the summer months for use in the winter season, when production is at its lowest. The Dominion Chemist, Mr. Frank T. Shutt, has tried a great number of fluids and preparations and has found that the two best preservatives are a solution of water glass and lime water. Eggs preserved in either of these have been kept quite sound for over a year.

With the co-operation of the Biological Laboratory of the Health of Animals Branch, methods looking to the prevention and cure of tuberculosis in fowls and of blackhead, usually found in its most aggravated form in turkeys, are being sought for.

During the year, the Poultry Manager, Mr. A. G. Gilbert, made an extended trip through the western provinces, to examine into conditions there and to lay the foundation for more extended work with poultry in that part of the Dominion.

TOBACCO DIVISION.

The year 1912-13 has been a year of progress and transformation for this Division.

Up to the present, the Tobacco Division, besides imparting information to the farmers, has been carrying experiments on three Stations, one in Ontario (Harrow) and two in Quebec (St. Jacques l'Achigan and St. Césaire) as well as on a trial plot at the Central Experimental Farm, Ottawa.

Unfortunately, the Quebec Stations were of such small size that, whenever several varieties were grown together during the same season, the product of each was so small that it was practically useless to prepare it for the trade.

The St. Césaire Station, which covered an area of 7 acres, has been replaced by the Farnham Station, situated in the same district, but of a much larger area (74 arpents), near the town of Farnham. This new Station was taken over by the Division on May 28, 1912, shortly before transplanting time.

CENTRAL EXPERIMENTAL FARM.

Fermentation.—On account of delay in delivering the crop to the fermentation warehouse, treatment of the 1912 crop was not started until April 11. It was supervised by a foreman who had had two years' experience in tobacco warehouses at Farnham and St. Césaire.

Good temperatures were obtained in the piles of tobacco, although the crop was a little dry. The maximum temperatures were 49° C. and 51° C. The products were fermented three times in succession before being finally packed. The total time required for the fermentation from the moment the first bulk was formed until the products were packed was as follows: Fillers, from April 11 to June 18; binders, from May 11 to September 2. At the end of the operation the tobacco was in good condition, and of a fairly bright colour, with a good aroma and no rankness.

The crop.—The seedlings of the 1912 crop were set out on May 28. The beds which were established on black loam, disinfected with formalin, were very successful and gave a large number of seedlings.

The trial field on the Central Experimental Farm, which measures about one acre, is now used almost exclusively for the production of seed, a distribution of which is made every spring by the Tobacco Division. At times, rather large numbers of varieties are grown on this field, including not only the sorts grown for the production of seed, but also some new ones, or others recently introduced into Canada, that are being tested. There were thirteen varieties in 1912.

The season was not altogether favourable to the production of tobacco. It was wet and cold, and fears were entertained at one time that the seed would not ripen before the frosts. It was not injured, however, although harvested very late, September 7 and 8.

The curing was done with difficulty on account of the wet weather which prevailed during the month of September.

STATION OF ST. JACQUES L'ACHIGAN, P.Q.

A three-year rotation is followed on this Station, viz., tobacco, cereal and clover. The first cycle of this rotation was completed in 1911. The tobacco crop of 1912 included the following varieties: Comstock, Aurora and Cuban.

Beds.—The beds were good, generally speaking. For the first time since this Station was established, no hotbeds were used (beds with fresh manure). The seeding was done on April 12, swollen seed being used, and the seedlings were ready to be set out about June 2.

The Crop.—The setting-out was delayed by persistent rains, which interfered with the preparation of the land and made it necessary to hold the seedlings.

It was only on June 15 that transplanting was really started. The seedlings were slow in taking root, owing to the extreme cold weather, and a great amount of damage was done by insects (as much as 30 per cent of the crop had to be replaced).

The crop was harvested from September 6 to 8, on account of threatening frosts. Most of the seed plants had to be abandoned, owing to the incomplete ripening of the heads.

The curing, somewhat delayed at the beginning by the cold weather during which the crop had been harvested, was carried out without mishaps. Artificial heat was employed for reducing the ribs of the leaves, small fires of charcoal being built for the purpose on the floor of the curing house.

In spite of the poor season, the yields were satisfactory. They were as follows: Comstock, 1,242 pounds per arpent; Cuban, 792 pounds; and Aurora, 1,304 pounds. The last-named variety proved a particular attraction at the annual fair at St. Jacques l'Achigan in January, 1913.

FARNHAM STATION.

This farm was almost abandoned when the Tobacco Division took possession of it. When put into good shape, it will prove a splendid demonstration of what may be accomplished by good management, as it had to be almost completely reorganized.

Soils.—A physico-chemical analysis gave satisfactory data. The land possesses average fertility, although considerable variations were observed in the various soil-samples, especially in the quantity of nitrogen contained. It cannot be said to be an exhausted soil, but rather a neglected farm.

Preparation.—Many difficulties were met with in the preparation of the soil. The land was taken over at a late date, the fall ploughing had been done too late, and too shallow, and had to be supplemented by a lot of work with the disc harrow. The

land remained wet a long time owing to poor drainage facilities. There was no grading, nor any open furrows, the land had been cross-ploughed and, furthermore, it rained almost continually. The fields planted in tobacco were manured at the rate of 18 tons to the acre.

Beds.—The beds had been established on some nearby land, kindly put at our disposal. They were seeded on April 12 and 13, and the seedlings were ready to be transplanted on May 28.

Transplanting.—On account of unfavourable circumstances, transplanting could not be started before June 15, and was not finished until the 30th. The seedlings took root slowly. They were beginning to weaken, as some of them had been kept over ten days. Cutworms and army worms did a great deal of damage, and a great number of plants had to be reset.

Plantation.—The following varieties were included in the plantation: Big-Ohio-x-Sumatra, Yamaska, Havana-Seed-Leaf, Brazil, Comstock Spanish, Rusticas and Cuban. The growth was slow and weak. Owing to the dampness of the season, the greater part of the tobacco went to seed prematurely and less than half a crop was obtained. The only variety that had a normal stand on some parts of the plantation was the Big-Ohio-x-Sumatra.

On the Farnham Station, the seedlings were set out late, and the crop was harvested at the end of September. The last part of it was taken in on the 26th. The rains which fell during the harvesting operations prevented the tobacco from ripening completely. Curing was, however, effected without any trouble.

Fall Ploughing.—As soon as the tobacco crop was safely housed in the curing barn, the whole farm was ploughed up; land which had been twenty years in sod was ploughed as early as possible. Some grading was done and furrows were opened for carrying off the water in the spring. The ditches were cleaned and deepened, and the plot which was to be planted in tobacco in 1913 was manured in the fall at the rate of 18 tons per acre. The effect of this treatment was soon noticeable; the land which in May, 1912, could not be cultivated was almost ready in March, 1913, in spite of a wet spring.

Buildings.—None of the buildings that were on the farm when the Division took it over were in shape to be used. One of the sheds was used temporarily as a shelter for agricultural machinery, but a curing house had to be built as soon as possible. It was completed in the first days of September. This curing house is large enough to receive the crop of twelve acres. In the fall and winter, a horse stable, a stripping barn and a double-purpose shed, to serve as curing house and implement shed, were built. With its present equipment, the Farnham Station is able to produce and take care of 15 acres of tobacco.

THE HARROW STATION.

The common varieties of tobacco used in southern Ontario are grown and tested on this Station. Owing to the nature of its soil, it is more especially adapted to the growing of Burley tobacco.

A three-year rotation is followed: grain, tobacco and corn. Clover is sown with the grain, and ploughed under in the spring, when the land is being prepared for the setting out of tobacco.

The fall wheat was seriously injured during the winter and the land had to be seeded over again in the spring. On the other hand, a splendid crop of corn was secured, and yields of 145 bushels to the acre were obtained on some plots.

Beds.—Although the spring was not very favourable to the beds, those of the Harrow Station gave, in due time, a large number of seedlings. Of the various beds used every year on this station, the one sheltered by glazed sashes (hot or cold) has, so far, given the best results in earliness and production. It cannot be too highly recommended.

Setting out.—The seedlings were set out in the beginning of May. The weather was rather cold for the season, and the recovery was a little slow. The cutworms were soon checked by the use of a mixture of bran and Paris green.

Crop.—The growth of the crop was rather slow, the temperature being much below the average of normal years during the whole of the season, but it did not suffer any checks, at least on the field of Burley, which was harvested on September 21, a rather late date even in Ontario, although frosts are not to be feared at that time of the year. The seed plants had a normal growth, and a large crop of selected seed was secured.

Some idea of the fertility of the Harrow Station may be gained from a comparison of the yields obtained in 1912 (1,200 to 1,950 pounds per acre for the Burley variety) and the average yields obtained during the same year by the growers of Burley in Ontario, which hardly exceeded 1,000 pounds per acre.

It should be stated that the season was not very favourable, but it is in a poor season that the benefits of intensive cultivation show to the best advantage. The soil is in such a state of fertility that it may produce an almost normal crop so long as atmospheric conditions are not absolutely contrary.

Yellow Tobacco.—The yellow tobacco was the only one that really suffered from the poor weather conditions. The yield in weight was satisfactory, but the colour might have been brighter. However, a bright colour is not to be expected unless the season is particularly favourable (a warm and comparatively dry season from transplanting to ripening). It cannot be hoped for in a cold and damp year, when the tobacco grows slowly and keeps on growing when it should be ripening. The Tobacco Division will test varieties of yellow tobacco which have given good results in temperate climates under conditions nearly similar to those that are found during a part of the year in that district of southern Ontario where the industry of yellow tobacco has been endeavouring for some time to get a foothold.

DISTRIBUTION OF SEED.

The samples of tobacco seed distributed in the spring of each year contain about one-quarter of an ounce of seed, selected and tested. The total crop of seed for all Stations was about 80 pounds, representing a total value of about $500. Over 3.600 samples were distributed during the spring of 1913. In a number of cases, the requests for samples were accompanied by a request for information, and a large correspondence ensued.

ADMINISTRATIVE CHANGES.

From the 16th January, 1913, by decision of the Minister, the Tobacco Division has formed a part of the Experimental Farms system. This change will be beneficial in many ways. The officers of the Division will now be able to give their whole time to the study of questions in which they are directly interested, as they will be relieved from many duties which had only a remote relation to their work.

EXPERIMENTAL STATION FOR PRINCE EDWARD ISLAND.

Charlottetown, P.E.I.

CHARACTER OF SEASON AND GENERAL CROP NOTES.

A mild spell of weather about the middle of April, 1912, gave promise of an early spring, and sweet peas were sown on the 17th. Cold, dull weather followed, and it was not until May 11 that seeding began at this Station. The greater part of May was so backward that the leaves and blossoms were fully three weeks later bursting out than in the spring of 1911. A frost that wilted the clovers occurred on the 22nd. June was decidedly cool. The mean temperature was more than a degree below the average. Cutworms did much damage in the province. During the first half of July, the heat was extreme, and during the last half the rainfall was excessive. Large quantities of hay were ruined throughout the province. The cool, late spring and the heavy rains of July and August caused the hay crop to fall below the average, both in quantity and quality. The early grain also suffered much from this, and gave yields much below the same varieties sown later, a very unusual occurrence in this part of Canada. In many sections, haymaking was continued until harvest, or about the third week of August. The oats filled well, but smut was very prevalent. Rust and the joint worm did much injury to the wheat crop. September proved to be a good harvest month. The late grain ripened very slowly yet, where it did mature, it was heavy and well filled. No killing frost occurred during the month.

The potato crop was good and, when harvested, very free from rot. The corn, mangels and sugar beets were scarcely an average crop, but the turnips and carrots gave heavy yields. A severe frost occurred on the 16th of October, but it was not until the 12th of November that the hardy annual and perennial flowers were killed. They made an excellent showing up to that time. The weather was open and a very large percentage of the fall work was completed in the early autumn. Enough snow fell on November 29 to make fair sleighing. December was stormy, with sudden changes and high winds. The ground remained bare practically the whole month and most of January, which month was remarkably fine and mild. It was not until the 12th day of February that there was enough snow to make good sleighing, which continued for a month only. The extreme cold of February was followed by a mild March, the snow going away suddenly. It was accompanied by heavy rains causing many bad cuts and washouts in the fields and on the highways. The clover which gave great promise last autumn, due to plenty of moisture during the growing season, appears to have wintered well.

ADDITIONS TO FARM.

The following properties have been added to the Experimental Station: (1) Twelve acres from the Johnson and six from the Connolly estate. These two areas adjoin and extend from that part of the Experimental Station which lies across on the west side of the railway to the Malpeque road. (2) Six acres from H. C. Connolly, six acres from Judge Haszard and ten acres from St. Dunstan's College. These areas adjoin one another and extend the Experimental Station north along the east side of the Prince Edward Island railway, from the DeBlois road, 18 chains, and have a frontage of 6 chains on the Mount Edward road. In all, 40 acres were added to the Station.

BUILDINGS.

A sheep barn, 100 feet by 20 feet, was built to the northwest of the main barn. Two portable poultry colony houses, 12 feet by 8 feet, were also built.

UNDERDRAINAGE.

The tile-drained areas gave very satisfactory yields, notwithstanding the most excessive rainfall of July. Land that, previous to being drained, did not produce as much barley as was sown for seed, gave yields of barley at the rate of 50 bushels per acre.

HORSES.

The four horses that are on the Station have been healthy throughout the year and are in excellent condition for the spring work.

GENERAL WORK.

The areas about the foreman's house, in front of the machine shed, and between the shrubs along the Prince Edward Island railway were seeded down to lawns. The roads about the farm were kept graded and in good condition by the use of the split-log drag.

EXPERIMENTAL WORK.

Experiments in feeding steers and lambs were continued on a larger scale than the previous year. The results of these, and of the experimental plot work with cereals, roots, corn, grasses, and of the work in horticulture and field husbandry will be found in the detailed section of this report.

CO-OPERATIVE WORK.

With the assistance of Mr. G. LeLacheur, of the Seed Division, three varieties of oats were tested in duplicate on a number of farms in the eastern section of the province. This work is to be continued. Among the varieties tried, Banner led on all the farms.

FARMERS' PICNICS.

Twelve Farmers' Institutes came to the farm in July and August and held picnics. These were greatly enjoyed and gave to many an insight into the work of the Experimental Station, so that the reports and bulletins will be of greater benefit, and future visits looked forward to. This will prove a direct connecting link between the Experimental Station and every farm in the province.

SEED FAIRS AND EXHIBITIONS.

Exhibits were prepared and shown at the two County Exhibitions and at the Provincial Exhibition held at Charlottetown. The Superintendent gave assistance by judging and by giving addresses at six fall exhibitions and at five seed fairs held during the winter. The attendance and interest at all of these were excellent. The quality of the exhibits of field crops showed much improvement. He also gave assistance at the Short Course held at the Nova Scotia College of Agriculture, Truro, N.S., from January 10 to January 16, 1913, and assisted by Messrs. Boving, of Macdonald College, B. H. Landells, of Nova Scotia Agricultural College, and S. J. Moore, Seed Inspector, gave the instruction on Field Husbandry at the Prince Edward Island Short Course held at Charlottetown from January 27 to February 8, 1913, at which about five hundred students were in attendance. Owing to the large number of students, it was necessary to make two divisions and repeat all the work.

VISITS TO FARMS AND AGRICULTURAL MEETINGS.

The Superintendent made as many personal visits to farms throughout the province as possible, and gave information and instruction as opportunity offered.

In conjunction with the Conservation Commission, sixty quarter-acre alfalfa plots were sown, and inoculated soil sent from the Experimental Station to all who applied for it. This was so distributed that such soil should be available this spring in almost every section of the country. He addressed Farmers' Institute meetings in many districts of the province during the year, which were well attended.

CONVENTIONS AND ASSOCIATIONS.

The Superintendent attended the Central Farmers' Institute Convention, the Fruit Growers' Association, the Dairymen's Association, the Floral Association, the Stock Breeders' Association, both Maritime and Provincial, and the meetings held at the Winter Fair at Amherst, N.S.

DISTRIBUTION OF SEED POTATOES AND SALE OF SEED GRAIN.

Twenty-eight samples of potatoes were sent out in April, 1912, two lots of Marquis wheat and eleven lots of Banner oats were sold to farmers for seeding in 1912.

VISITORS.

There were 5,427 visitors to the Station during the year; many more are planning to come during 1913.

METEOROLOGICAL RECORDS.

MONTHS.	Temperature Fahrenheit.					Precipitation.					Bright Sunshine.
	Maximum.		Minimum.		Monthly Mean.	Rainfall.		Snowfall.		Total Precipit.	
	Date.	Degrees	Date.	Degrees		Days.	Ins.	Days.	Ins.		
April........	16	62	5	12·	35·72	9	2·37	7·	7·9	3·16	163·1 hrs.
May	27	79·	1	27.	50·53	9	2·64	.....	......	2·64	235·0
June..........	24 and 25	84·5	11	36·	57·82	12	2·49		......	2·49	251·1
July....	10	91·5	1	39·	64·90	16	6·83	.....	......	6·83	195·8
August.. ...	14	81·	30	45·	61·68	19	2·68	......	.... .	2·68	181·9
September....	15	73·	22	38·	54·02	9	2·90	......	......	2·90	167·9
October.	7	73·	17	28·5	47·71	15	3·72	......	....	3·72	134·2
November	7	65·	12	25·	37·01	15	3·59	2	6·5	4·24	51·7
December.....	20	50·	13	-2	26·60	10	5·40	4·	10·5	6·45	68·7
1913.											
January.......	4	50·	10 and 29	-3	24·17	11	2·01	7	15·7	3·58	82·6
February......	1	48·	7	-17·5	13·46	1	·34	9	21·8	2·52	117·6
March..	21	60·	8	-4·	30·80	13	3·21	7	14·	4·61	131·
Total Annual....						139	38·18	36	76·4	45·82	1780·6

Note:—One inch of rain being figured as equivalent to ten inches of snowfall.

PLATE V.

View of Farm Buildings, Experimental Station, Kentville, N.S.

EXPERIMENTAL STATION FOR THE ANNAPOLIS VALLEY.

KENTVILLE, N.S.

The Superintendent, Mr. W. S. Blair, assumed his duties on the 15th of June. Active work at this Station was started in the spring. During the summer, several buildings were erected, grading was done, and necessary roads were made. As the greater portion of the farm was in woods when taken over, the labour on the land has been principally stumping, clearing and breaking. An orchard of eighteen and one-half acres was set out in May, on land which had been cleared the previous season.

LOCATION.

This Station is located partly within the limits of the town of Kentville, about one mile from the centre of the town. It extends from the Cornwallis river in a southwestern direction for about one and one-third miles. The width of the farm is variable, running from 1,200 feet frontage on the main road leading from Kentville to Wolfville, to 2,400 feet at the widest point farther south. The Dominion Atlantic railway runs through the northern section of the farm.

FARM AREAS.

The farm at present comprises an area of 294 acres. The first purchase from Kenneth Sharp was for an area of 250 acres. During this year, 44 acres were purchased from Eugene Roy. An option is held on 7 acres, which it is proposed to add to the above area, making in all 301 acres. The marsh land survey is 11½ acres of which 9 acres are within the dyke. About 18 acres on the northern portion of the farm, on which the buildings are located, which is more or less broken with abrupt hills and will not be fit for agricultural purposes, has been graded ready for seeding to grass, and will be given over largely to ornamental planting. Some scattered apple trees around the hillside on this area produce annually about one hundred barrels of apples, principally Ribston and King. Above this, there is 55 acres which has recently been cleared from woods, of which 18½ acres have been planted to orchard. The most of this 55-acre field is now in fairly good condition for cropping. It is all sloping toward the north, and the soil is of a sandy loam, thin and poor. Above this, extending to the southern boundary, the land is fairly level, not quite so sandy and apparently more fertile. Sixty acres of this is ready for stumping and ploughing, and another forty to fifty acres no win woods will be cleared later. About 100 acres is taken up by a deep ravine, some one and one-quarter miles long, which is heavily wooded. This area will not be cleared but will be preserved as a natural park.

BUILDINGS CONSTRUCTED.

During the summer, eight buildings were constructed. The Superintendent's house, 43 by 40 feet, with a kitchen 28 by 18 feet; foreman's house, 30 by 30 feet, with a kitchen 24 by 12 feet; double tenement house for herdsman and gardener, 40 by 32 feet, with kitchen 30 by 25 feet; barn, 78 by 47 feet, to accommodate seven horses and twenty-five head of other stock, with a root house, 38 by 18 feet and 10 feet deep, to hold 100 tons roots, and a silo, 30 feet high and 15 feet in diameter, for 125 tons corn; attached carriage house, 30 by 18 feet; dairy building, 20 by 15 feet; poultry building, 26 by 18 feet, and a greenhouse, 50 by 20 feet, with potting and

work room attached, 25 by 18 feet. These buildings were all built of wood and, with the exception of the barn, which was clap-boarded with pine siding, were shingled with cedar shingles.

EXPERIMENTAL ORCHARDS.

As no mature orchards are growing on the farm, it has been considered advisable to lease 5-acre blocks of mature orchard at Berwick, Kings county, Bridgetown, Annapolis county, and Falmouth, Hants county. These orchards are to be devoted to experimental work in spraying, fertilizing, thinning of fruit, etc. In this way it is hoped that information of greater value to the orchardist will be secured than is possible with the young orchard just planted at the Station.

ORCHARD PLANTED.

Eighteen and one-half acres of orchard, made up principally of varieties commercially grown in the Annapolis valley, were planted in the spring of 1912. These trees have made excellent growth.

STOCK.

One driving horse and three pair of team horses are kept at this Station. Three pair of working oxen for breaking up stump land are also used.

Nineteen steers were fed during the winter. These were put in to make manure for field work and to use up rough feed and some 1,500 bushels of roots grown during the year. The steers were an uneven lot and no experiments were conducted with them. One cow is kept for milk.

EXPERIMENTAL FARM FOR NOVA SCOTIA.

NAPPAN, N.S.

The spring of 1912 opened dull and cold with some frosts during April. No snow fell, but there was a rather heavier precipitation than usual. May was also cold and, for the first three weeks, dry, just enough rain falling to retard seeding operations. Seeding was general about the 15th of the month. During the last week of May, the rainfall was heavier than usual. Although no great amount of rain fell during June, showers were frequent, and the month was cool. Grain and roots did fairly well during the month, but corn was at a standstill.

July was a warm, dry month until the 22nd, from which date until the end of the month, 6·62 inches of rain fall. Hay and grain did well during this month, but roots made only a poor growth.

From the 22nd of July until the end of August, rain was practically continuous, making haying almost impossible, lodging the grain and having a most disastrous effect upon the root crops, it having been impossible to do any cultivation during all that period. As a result, unusually small crops of roots and corn were harvested.

From this time onward, the season was quite favourable for harvesting and the usual fall work. There were no extremes of drought, wet, heat or cold until the last day of November, when 18 degrees of frost were registered.

December and January were unusually mild, with very little zero weather and not snow enough falling at any time to make sleighing.

February was very cold, the extreme being –15 degrees on the 7th. Seventeen inches of snow fell, making good sleighing during the latter part of the month.

Fine, typical winter weather prevailed during the first week of March, gradually getting warmer toward the middle of the month, which ended with high winds and snow squalls.

LIVE STOCK.

The experiment commenced last year of grading up the common cattle of the district, by the use of a pure-bred bull, was continued. The twelve heifers originally chosen have all calved and have finished a lactation period between January 1, 1912, and January 1, 1913. It will, of course, be some years before comprehensive and final results can be announced, but the milk records and profits shown year by year are of considerable interest.

In feeding for beef, the results of the experiment commenced in January, 1912, and finished April 30, 1912, show that forty-five steers, divided into three lots of 15 each, gave an average profit per steer of $11.23, $9.48 and $12.69 for the three lots respectively.

The experiment commenced this year was concluded on March 15, in time for Easter delivery. There were thirty-four head under feed, one lot of ten and one of twenty-four. The former gave an average profit per steer of $19.61 and the latter one of $18.22.

A sheep-feeding experiment was also conducted. Forty grade wethers were divided into four lots of ten each and were fed different rations. The net average profit of each group was: Lot 1, $1.43; lot 2, $1.37; lot 3, $1.43, and lot 4, $1.50 per head in each case.

A test of the value of skim-milk as a feed for swine was conducted during the year, one lot being fed three pounds of skim milk per day and another, six pounds, the other constituents of the ration being the same for both lots. Those fed the larger quantity of milk made more economical gains, a saving of $\frac{6}{10}$ of a cent per pound increase in weight being effected.

CEREALS, CORN FOR ENSILAGE AND ROOTS.

In cereals, eleven varieties of wheat ranged in yield from 36 bushels to 20 bushels per acre. Twelve varieties of oats ran from 97 bushels 20 pounds to 82 bushels 12 pounds per acre. Six varieties of six-row barley yielded from 59 bushels 8 pounds to 40 bushels per acre, and the same number of two-row sorts ranged from 62 bushels 24 pounds to 41 bushels 32 pounds.

The pea crop was a very poor one, owing to the continued wet weather delaying harvesting until September 24. The yields of ten varieties were from 17 bushels 20 pounds to 7 bushels 20 pounds per acre.

Five varieties of buckwheat gave yields of from 47 bushels 24 pounds to 41 bushels 32 pounds per acre.

The unfavourable season reduced the yield of Indian corn for ensilage, the average being five tons of forage per acre.

In roots, turnips yielded from 31 tons 1,000 pounds to 25 tons 700 pounds per acre; mangels, from 25 tons 400 pounds to 10 tons 400 pounds; sugar beets, from 8 tons 200 pounds to 5 tons 100 pounds; and carrots from 16 tons 1,000 pounds to 12 tons 500 pounds. Nineteen varieties of potatoes ranged in yield from 413 bushels 20 pounds to 171 bushels 40 pounds per acre.

FRUITS AND VEGETABLES.

The apple crop was above that of 1911 in quantity, and equal to it in quality. Most small fruits did fairly well, although there was some damage from the wet weather which also delayed and, in some cases, prevented the maturing of vegetables such as tomatoes, garden corn and melons.

An exhibit of farm products was made at the Nova Scotia Provincial Exhibition, Halifax, N.S., and at the Colchester County Exhibition at Shubenacadie, N.S.

During the year, the Superintendent delivered a considerable number of addresses at various points, as well as assisted at Short Courses, etc.

The number of visitors to the Farm during the year was 4,015.

The annual distribution of seed potatoes was carried on, the number of samples distributed being 484.

The following are the meteorological records for the year ending March 31, 1913.

METEOROLOGICAL RECORD.

Months.	Temperature F. Monthly.					Rainfall.	Snowfall.	Total Precipitation.	Sunshine.
	Maximum.		Minimum.		Mean.				
1912.	Date.	°	Date.	°	°	Inches.	Inches.	Inches.	Hours.
April	16	66	10	17	37·64	1.84	2	2·04	117·0
May	27	77	6	24	50·27	2·74	....	2·74	164·0
June	25	84	15	35	56·29	2·32	....	2·32	242·0
July	10	92	1	40	63·61	6·62	....	6.62	151·0
August	23	81	26	38	60·75	4·82	....	4·82	175·80
September	15	73	10	33	52·99	2·86	....	2·86	149·90
October	7	74	22	25	46·80	1·67	....	1·67	146·90
November	7	66	30	14	36·32	3·20	5	3·70	77·45
December	19	51	13	0	26·33	5·22	4	5·62	81·50
1913.									
January	12	52	10	-4	23·96	2·42	5	2·92	80·95
February	1	51	7	-15	13·31	·45	17	2·15	112·15
March	20	62	8	-1	....	5·86	3	6·16	140

NOTE.—Ten inches of snowfall is reckoned as one inch of rainfall.

EXPERIMENTAL STATION FOR NEW BRUNSWICK.

FREDERICTON, N.B.

As the land for the Experimental Station here was not purchased until September last, this report can only be very brief.

The land comprises an area of approximately four hundred and fifty (450) acres. It is situated within the limits of the city of Fredericton, fronting on the St. John river, and is crossed by the Canadian Pacific railway, the platform known as Doak being on the Station land. The line of the St. John Valley railway crosses the Station close to the bank of the St. John river. The centre of the farm is about three miles down river from the centre of the city proper.

The area was made up of farms, belonging respectively to John O. Adams, Dell Gunter, H. C. Jewett, A. H. Waterhouse and W. W. Boyce. None of these farms had more than a small proportion of land in a good state of cultivation. Of the whole area, only about one hundred acres has been in crop.

Some twenty acres of sod were ploughed for the planting of corn, potatoes, roots, etc., and about six acres were ploughed on the Boyce property when it was bought. Much of the land requires drainage to secure maximum crops.

With the object of getting all the land lying between the Canadian Pacific railway and the river under cultivation, comprising an area of approximately three hundred acres, as much land as possible was brushed and ditched before winter conditions set in. The place was also surveyed, and a road through the centre of the

farm laid out from the river to the Canadian Pacific railway track. There was some work done on the construction of the road. Cedar posts and woven wire were bought and a portion of the roadside levelled for fencing.

During the winter, from four to five men were kept at work cutting bushes and wood, and digging and hauling gravel for road purposes. The nearest gravel pit from which a supply could be obtained was across the St. John river, on the property of the Fredericton and Grand Lake Coal and Railway Company. Two hundred and ninety yards of this gravel were bought, and hauled to the Station. As there was quite a demand for the wood growing on the land which it was desired to clear, it was possible to sell it for what it was worth standing, and the purchasers have cut the land clean, piled the brush and removed the wood. It is hoped to be able to burn this land over, and use for sheep pasturage what it is not possible to break up this coming season.

As no barns suitable for Experimental Station purposes are on the place, a complete outfit of new buildings will have to be erected, as well as a residence for the Superintendent, and several houses for the staff.

Four Clydesdale grade mares were sent from Ottawa, and worked throughout the fall and winter. Two of these mares were bred on the 4th of December to a Clydesdale stallion.

Some manure has been purchased in the city and hauled to the farm.

Ornamental plants and trees have been ordered, and will be set in 1913 in nursery rows.

No stock other than the horses above mentioned have been bought with the exception of a small flock of fowls. These fowls, comprising eleven Barred Plymouth Rock and six Rhode Island Red pullets with a cockerel of each breed, were put in on the 1st January. They laid, during January, 184 eggs; during February, 84; and during March, 287; a total of forty-six and a quarter dozen for the three months from the seventeen pullets. These birds were kept in a shed, which, while dry, was as cold as out-of-doors. The only provision made for protection from the cold was an enclosed roosting pen, across the front of which a curtain was dropped at night. An ample supply of litter was given, and kept dry by frequent renewal. The whole grain part of the ration was scattered through the litter, and the hens kept at work scratching. On fine days, the flock had the run of the barnyard. While the thermometer was above zero, no inconvenience from cold seemed to be felt, but when it fell lower, and especially when the wind was high, egg production shrank, the birds seemed to be rather mopy, and the combs of the cockerels were frozen somewhat. Small wheat and screenings formed a considerable portion of the ration, and it was aimed to supply a moderate quantity of everything necessary for health and egg production. Raw turnips were provided, and apparently much relished. Cut green bone was mixed with mash consisting of boiled potatoes and cracked oats. Some coarsely cracked corn was scattered in the litter with the wheat. The eggs sold at thirty cents per dozen.

Some repairs were put on the buildings to make them comfortable for horse stabling, and two small houses on the farm, occupied by the foreman, teamsters and some of the extra men working on the farm, were also repaired to some extent. An office building of one story, 12 feet wide by 30 feet long, was built. Implements and tools needed for the fall work were purchased and a portion of the equipment for 1913 ordered.

EXPERIMENTAL STATION FOR EASTERN QUEBEC.

Ste. Anne de la Pocatière, Que.

THE FARM: SITUATION, AREA AND NATURE.

The Experimental Station for Eastern Quebec has been described as follows in the Experimental Farms Report for 1911:—

'This farm is composed of two holdings, one of eighty-four arpents, occupied by Mr. Antonio Gendron, and a part of that occupied by Mr. Georges Hudon, about sixty arpents, making 144 arpents, or about 120 acres, in all.

'These properties lie immediately west of Ste. Anne de la Pocatière station on the Intercolonial railway. They are traversed from east to west by the main travelled road of the counties of Kamouraska and L'Islet. A much-used road to the southward starts on the west side of the Gendron property.

'These farms consist each of a stretch of level land extending south from the Intercolonial railway for about 1,100 yards to the foot of a hill, from which point they rise for another 1,000 yards, or thereabouts. The level part of the land consists of heavy clay soil, possible of drainage, which would be needed. The upper, or rising land, consists of porous gravelly soil, in some parts covered, to a greater or lesser extent, with boulders. The hill land is, in part, arable, or capable of being made so. The lots are each about 120 yards wide. The land would be very suitable for experimental work, as it is quite typical, in character and situation, of the land of this district.'

To complete this description, it may be stated that the farm is situated seventy-five miles from the city of Quebec, in latitude 47·22 north and longitude 70·02 west, on the south shore of the St. Lawrence. The average altitude from the St. Lawrence river is 47 feet for the low part of the land and 334 feet for the southern limit. As the farm rises from the railway like an amphitheatre, a good view of it may be obtained from the Intercolonial trains.

A creek runs obliquely through the farm, at the foot of the hill; the water in this creek is of excellent quality. It is the surplus of the springs on the hill, which have been piped. The water pipe, which belongs to the Ste. Anne de la Pocatière college, passes along the western boundary, and supplies the farm with water.

THE SEASON.

The season was extremely damp and cold, most unfavourable for field work and the ripening of crops. More than 80 per cent of the farmers of this district will have to import seed grain for next year. The hay crop, which looked very promising at the beginning of the season, only gave an average yield, of poor quality.

It rained for twelve consecutive days, from the 1st to the 17th of June. During the night of the 15th the creeks overflowed their banks and the low land was submerged. The grain which had been sown during the first week of May was damaged to some extent. However, only the grain sown at that time gave satisfactory yields, for from the 14th May to the 20th June, very little seed could be sown in this district.

The land on the Experimental Station had been so carefully prepared during the fall of 1911 that the average yield of oats, in spite of the unfavourable season, was 32 bushels to the acre.

The Indian corn was sown on June 24 and 25; it came up well and made a good growth during the first half of July, which was dry and rather hot.

The latter part of July and August was very damp, cold and cloudy. Haying was slow and difficult. A splendid second growth was obtained on clover meadows

and a good catch of clover and timothy was secured in the grain fields. September was wet and cold; there was a white frost on the 16th, two inches of snow on the 29th and sleet on the 30th.

October was also a very rainy month; much grain had to be left in the fields and the rest was housed in bad condition.

November was damp, but the total fall of rain and snow was not very large.

December was mild, with a little more snow, but hardly enougn to make good winter roads. The winter was characterized by frequent and light falls of rain and snow, and sudden changes of temperature. The high winds accumulated large quantities of snow in the woods and the ravines; the earth which was bare became covered with ice, owing to the frequent thaws during the winter. It is to be feared that the meadows will be damaged or destroyed.

The worst snow storm of the winter came on the 6th and 7th of March; there was a big thaw on the 2nd and 22nd of March, with a high gale. The rest of the snow almost completely disappeared, and the roads were flooded for several days in many places. The rest of the month was cold, with a heavy rain on the 31st.

LIVE STOCK.

There is, as yet, no live stock on the farm, with the exception of horses, but there will be some next year. There are two teams of draft horses, weighing respectively 2,900 and 2,800 pounds, and a light horse for lighter work and for the use of the Superintendent. An old horse, unfit for work, was sold and replaced.

IMPROVEMENTS.

The following buildings are now on the farm: A house, 28 x 33 feet (the residence of the Superintendent), which was repaired last summer. It was clapboarded and given two coats of paint; the old shingles were replaced by galvanized iron; a good stone wall, with good sashes and double doors, was built around the basement. The upper story was boarded up and divided into four rooms, making a comfortable and good-looking house. Another house, 30 x 32 feet, which will be used as a house for the herdsman, was repaired in the same way, with the exception of the masonry around the basement, and the roofing. It is now a comfortable building. A barn 28 x 95 x 20, with a stable 20 x 40 which may be used as a sheep barn when repaired and improved is on the property. Some urgent repairs have already been made. There is also another barn of 27 x 75, with a stable 27 x 28. It is in rather poor shape and in a poor situation, and will have to be taken down. However, it has been repaired for temporary use. A shed in fairly good shape but sunk in the soil, was raised two feet and put on a good stone foundation; temporary grain bins were built in the upper story. A shed, 14 x 15, was rebuilt and turned into a storeroom.

The large dairy stable is supplied with water through a pipe, 882 feet long and one inch in diameter; two half-inch pipes (146 feet and 148 feet respectively) connected with the above, bring the water to the houses, which have been fitted with closets and sinks. The water pipes were laid at an average depth of 54 inches. Draining wells (cesspools) of 6 x 6 x 5 were dug about 50 feet from the houses, to receive waste water. These wells are wooded and covered with cedar. The soil is very permeable at that place and the waste water readily escapes through the bottom of the wells.

IMPROVEMENT OF THE ROADS.

The front road, which was in very poor condition, has been repaired; it has been graded, widened and left with a good crown and good ditches. The land being

a heavy clay, it is hard to keep this road in good shape in wet weather. It should be covered with stones or gravel.

FENCES.

Along the front road a fence of 8 strands of No. 9 wire, and 40 inches high, was laid on good turned cedar posts, 6 x 6 inches and set 10 feet apart. These posts are connected at 52 inches from the level of the soil by a rail, 3 x 4, and the whole fence is painted with two coats of paint. Gates, 15 feet wide, give access to the different fields, and a double artistic-looking gate, 16 feet wide, and one 4 feet, of the same design, close the avenue. The gate and corner posts are 8 x 8 and 12 x 12 respectively, sunk to a depth of five feet and set on stones; facing the proposed buildings, there is a lawn fence painted green.

On the high road, to the west, and on the south road facing the farm, as well as on other parts of the farm, 3,188 yards of fences, 48 inches high and made of 10 strands of No. 9 wire were put up. All the posts are dressed cedar, 6 to 8 inches; the upper part is rounded and painted. They were set at intervals of 16 feet 6 inches. The posts are sunk 3 feet and more in the soil, which makes a very strong fence. Gates, 14 and 15 feet, at various places on the high road, give access to the other fields. A number of culverts of various sizes, according to the widths of the creeks, were laid on the farm. A bridge, which was too low and in poor condition, was rebuilt on good foundations of stone and cedar.

DRAINAGE.

More than 6,000 feet of drains were laid during the past season; part of these drains were laid in a four-acre field at the foot of the hill. This was ploughed last July; it was worked up, graded, cleared of stones and an orchard of more than 400 trees will be set out in the spring.

A number of ditches were dug or widened; others were started, and will be completed next season; others again will need to be made larger. A large number of stones were removed from various parts of the farm, and more particularly from the drained fields. Nearly six acres of new land were ploughed for the first time, and more than 600 yards of stone were taken off the fields.

About 14 acres of land, covered with brush, or wood of little value, were cleared. The greater part of this area is marshy land, on the high part of the farm. When drained, this area will be possible of cultivation.

The other fields were not laid out in a suitable manner for an Experimental Station when the property was purchased. A part of the old fences were removed; and four different rotations of three, four and five years respectively will be started this spring.

FRUIT TREES.

There are, near the buildings, thirty-four apple trees of all ages, including six varieties; some of these trees yield very little fruit, while others do not yield anything. The apple crop was an average to a poor one, and of inferior quality. There are, in the same place, eighteen plum trees, made up of five varieties. The plum crop was a very good one on the Station and in the whole district.

Two shipments of European plums, forwarded on the 5th and 12th of September to the Dominion Fruit Exchange, at Ottawa. were classed as 'choice.' Two other shipments to M. Vipond & Co., Montreal, were classed 'excellent.' Some dead trees were removed and some others will have to be specially treated.

CEREALS.

Cereals were not grown from an experimental point of view last year. About twenty-five acres were sown in oats from the 6th to the 14th May. The varieties used were the

Banner and the Wide Awake. The crop was good in yield and quality. It was cut from the 13th to the 21st of September; the average length of the straw was three feet six inches, and the average yield thirty-two bushels per acre. A little rust was observed in the various fields, as well as some smut in the fields on the heavy clay land, and a great deal of smut in a field of about three acres, situated on a moist, sandy loam.

Two acres of oats were sown on the 24th of June, but did ot ripen. The oats gave a great growth of straw, which remained green until the 28th of September, date of cutting. Another acre of oats sown on the 26th of June on a piece of new land met the same fate. One acre of buckwheat sown on the 29th of June on new land made a poor start, and was ploughed under on the 2nd of September.

FODDER CORN AND ROOTS.

The season was most unfavourable to fodder corn. Three acres of Longfellow were sown on the 23rd and 24th of June. The seed was put in hills, thirty-six inches apart; the corn came up promptly but did not grow to a height of more than five feet, owing to the cold weather; also it suffered from a light frost on the 16th of September. The corn was cut on the last day of September, and gave some two tons to the acre. Another crop sown on new land gave about three tons.

A field of turnips, Magnum Bonum variety, a little less than one arpent in area, sown on new land the 3rd of July, with very little manure, came up very slowly and in a very uneven manner, on account of the unevenness and dampness of the field. However, in September and October the roots made a strong growth; the average yield of this field was eight tons to the acre.

METEOROLOGICAL RETURNS.

Month.	Monthly temperature F.					Rainfall.	Snowfall.	Precipitation.	Hours of Sunshine.
	Maximum.		Minimum.		Average				
	Date.	Degree.	Date.	Degree.	Degree.	Inches.	Inches.	Inches.	
January.........	19	35	22	25	15.65	2.05	20.00	4·05	73.3
February........	9	12				0.00	24.00	2·40	95.4
March...........	21	61	7	4	23.33	1.47	30 00	4·47	107.5

NOTE.—The recording apparatus was received on the 30th December.

EXPERIMENTAL STATION FOR CENTRAL QUEBEC.

CAP ROUGE, QUE.

CHARACTER OF SEASON.

The past season was the most unfavourable which the farmer of the Cap Rouge district has had for a quarter of a century. All crops, except hay, were below the average.

April was rather cold, and the snow went away slowly. On the 28th, the ice bridge was still solid on the St. Lawrence river, in front of the farm.

The first thing sown outside was sweet peas, on May 1. This month was one of the worst in years. It rained on fourteen different days, from the 7th to the 31st, and as there was nothing done before the first-mentioned date, seeding was kept back.

There was precipitation during thirteen of the eighteen first days of June. This kept seeding back so long that many farmers could not put in more than half the grain which they had intended to sow. The bulk of the oats was sown, at the Station, during the first and second weeks of the month, corn from the 19th to the 26th, potatoes on the 24th, swedes on the 28th and 29th.

A drought lasted from the 20th of June until the end of July. The land, which had been repeatedly flooded in early June was now parched and cracked. Everything had been sown late, and the dry weather stopped germination. At the Station, haying commenced on the 10th and was finished on the 20th.

August was wet and cold. Farmers who had delayed haying had a great deal of trouble, besides obtaining only a poor quality of feed. Grain grew well during this month, but corn, potatoes and roots were at a standstill.

September was damp and cloudy, sunshine averaging only a little over three hours per day. Corn did not grow, and was practically a total failure all through the district.

October was wet, as it rained on seventeen days. Nearly all the grain was cut during this month at the Station and vicinity. Much of it was still green, and most of it was light and will be useless for seed in 1913. Cutting corn was only begun on the 1st, and potatoes were dug on the 12th, at the Station.

November was dull, there being only 26·2 hours of sunshine during the month. Swedes were pulled from the 6th to the 11th. On the 14th, sleighs were used, but were discarded for wheels on the 22nd, and put into use for the winter on the 26th.

December was quite mild. The rain of the 20th, immediately followed by severe cold, caused a great deal of damage to fruit trees.

January was also very mild, and the rain of the 17th brought the snow down to ten inches. This was about two feet less than usual.

February was colder than last year, and furnished the only regular winter weather of the season. There were two bad storms, on the 15th and 22nd, and trains on most railways were either cancelled or very late.

March was mild and wet. The rains caused an early thaw, and the cold weather of the end of the month froze the ground which had been uncovered early. This will injure meadows and pastures, especially on low-lying places where the water stood.

FIELD WORK.

That the season was a very bad one, can readily be seen when crops of 1911 are compared with those of 1912. For instance, corn only yielded 21 per cent of what it did last year; swedes, 38 per cent; potatoes, 25 per cent; oats, 71 per cent. Hay yielded about the same as the year before.

Cultural experiment with Indian corn.—This was commenced in 1911 and continued in 1912. The following figures show comparative yield for the two seasons:—

In drills, 42 inches apart, 8 inches between plants..	100 per cent.
" 48 " " 8 " " " ..	95 "
In hills, 42 " " 42 " " " ..	69 "
" 36 " " 36 " " " ..	65 "

Of course, these results are far from definite, and too much importance should not be attached to them until two or three more experiments, at least, are made.

Rotations.—To make room for the extension of the orchard, one of the 6-year rotations had to be dropped out temporarily. A five-year rotation, however, was started so that there are now four: one 3-year, one 4-year, one 5-year, one 6-year.

LIVE STOCK.

Horses.

There are now at the Station five mares and two fillies, a 2-year-old and a weanling, all registered French-Canadians besides two teams of from 2,600 to 2,900 pounds weight per team, and a driver of about 1,000 pounds. Four of the pure-bred mares are in foal to a stallion of the same breed.

Exercise for colts.—Without feed of the right kind, and lots of it, it is impossible to grow a young animal as he should be grown. But when fed heavily, and kept in the stable during winter, a colt adds more weight to his body than the limbs can support, and the legs go wrong. The only practical preventive is exercise. A paddock, with a shed boarded on three sides and facing south, well bedded with straw, is the right place to keep the youngsters. At the Station, a weanling filly was turned out in such a place, every day of the winter, except three or four very stormy ones, from about eight in the morning until five in the afternoon. There was from one to three feet of snow in the paddock. She was fed with good clover hay, bran and oats, and the day she was one year old, she weighed 730 pounds. As her dam's weight is about 1,125 pounds, she should make a mare at least 100 pounds heavier than her mother.

Experiment wintering a horse at low cost.—The gelding which was used for this experiment last year was in splendid shape for the season's work. He had received one pound of hay from mixed grasses, one pound of straw, and one pound of swedes per day for each hundred pounds of his own weight. The bulky ration and the roots had a very beneficial effect on the digestive tract of the animal.

The same experiment was made in 1912-13 with a very nervous mare, fifteen years old. She weighed 1,350 pounds on November 1, 1912, and 1,455 on March 31, 1913. If she goes through next season's work in good shape, it would seem advisable for farmers who own more horses than they can use in winter time to try this way of feeding the idle animals.

Cattle.

There are now at the Station, one bull, nine cows, five heifers, registered French-Canadians; also ten cows, grades of the same breed, and four heifers out of these by a pure-bred Canadian bull.

The milk of each cow is weighed at each milking and a butter-fat test made each month. The cows themselves are weighed at different times, so that it will be interesting to see if the heifers of the grade cows, especially, will be improved in size, also in milk productiveness, by the use of a good sire, and with rational feeding.

Swine.

There are now one aged and two young boars, nine breeding sows, and three gilts, all registered Yorkshires. No feeding experiments have been started.

Sheep.

One ram and six ewes, registered Leicesters, were bought for this Station, and will be shipped as soon as the weather gets mild enough to prevent injury to the young ones, a number of which were dropped since the dams were purchased.

Poultry.

There are two pens of White Wyandottes, but as there is not room for more at present, just a few chicks were hatched this year.

TESTS OF VARIETIES.

This year, fourteen varieties of wheat, ten of peas, six of two-row barley, seven of six-row barley, eleven of oats, five of oats and barley, five of carrots, eight of mangels, three cf sugar beets, ten of swede turnips, and three of Indian corn were tested.

A uniform piece of land was chosen for the test plots, and a three-year rotation will be used. It will be divided into equal parts, one for roots and corn, one for cereals, and one to note how clover grows when seeded down with different cereals, with different varieties of the same cereal, and with the same cereal sown in different quantities.

HORTICULTURE.

Fruit.—A certain number of apple and plum trees, also of currant, gooseberry and raspberry bushes were added to the variety tests. About half an acre was planted to grapes, and an area of over seven acres of land was transferred from the agricultural to the horticultural division, to extend the apple orchard.

Vegetables.—There were 215 different varieties tested, and it was interesting to note that some of them only yielded from thirty to forty per cent of others of the same kind sown alongside. A couple of acres were used to grow vegetables for the market, and a part of the crop was packed in 'Home Hampers,' which are slatted crates containing six four-quart baskets. It is the intention to continue doing educational work in this line, as the price which the grower receives for his goods when marketed in the ordinary way is generally quite small compared with what the consumer has to pay for them.

Flowers.—Over 300 different kinds of annual and perennial herbaceous plants, shrubs, and bulbs were tested. A good deal of work was done on the ornamental grounds, which will be very attractive when completed.

STATION IMPROVEMENTS.

Granary.—A three-story granary, 40 x 50, was built during the year. A part of this will be used as an exhibition room, in which different varieties of cereals, weeds, etc., will be displayed; it will also be employed to hand-pick grain in during the winter. The upper or third story will be for the cereal division, and will serve as a storage room for all grain from the test plots, and that which is grown to be sold or distributed for seed. All the rest of the building will be for feed for live stock. The grist and the fanning mills will be installed on the ground floor underneath large hoppers made to hold one thousand bushels each.

Workshop.—A two-story workshop, 42 x 25, was also built during the year. It is on a concrete foundation and floor, and contains a good forge, wood and ironworking benches, anvil, vise, drills, etc. The upper story is used to store paint, glass, hardware and pieces for implements. Downstairs are places for small tools. All vehicles and machines will be looked over yearly, during the winter, repaired, and painted. Loose pieces, such as neck-yokes and whiffle trees are marked with a number, which is the same as that on the machine, so that there may be no mixing or exchanging of parts.

Painting Buildings.—All the Station buildings were painted, except the Superintendent's and the Foreman's houses.

Clearing Land.—About seven acres of land were stumped and ploughed. This is part of a tongue of brush, situated between two fields. Its removal will be quite an improvement to the looks of the property, whilst giving much-needed ground for crops.

Drainage.—Nearly 8,000 feet of tiles were put in during 1912, and excavations made ready for 3,000 feet more which will be laid early in 1913.

Waterworks.—An artesian well is being dug on the highest point of the Station, not far from a small pond. A concrete tank, to be filled by an engine, will be built in the ground, and from it water will be brought by gravitation to the different buildings of the Station, and to many of the fields.

VISITORS.

During the year, 1,330 persons visited the Station. A remarkable fact is that farmers very seldom criticise the Experimental Farm system after they have visited one of the Stations and have seen the work done or in preparation. This shows the wisdom of doing everything possible to improve facilities for such visits.

DISTRIBUTION OF SEEDS.

Up to March 31, 1913, 503 packages of sweet corn, and 200 of tomato seed were distributed whilst about 400 more packages of sweet corn were made ready to send out.

METEOROLOGICAL DATA.

Month.	Temperature.					Precipitation.					Sunshine.
	Date.	Highest.	Lowest. F.	Date.	Mean.	No. days.	Rain.	Snow.	No. days.	Total.	Total.
1912.		°	°		°		Inches.	Inches.		Inches.	Hours.
April	27	60	5·2	1	31·35	7	2·78	2·00	2	2·98	215·2
May	29	80	26·2	15	51·31	14	8·08	....	....	8·08	194·0
June	26	83	35·2	10	56·18	15	3·01	....	....	3·01	212·0
July	8	92	44·2	1	66·81	8	0·92	....	....	0·92	224·7
August	14	77	39·2	20	59·20	13	10·21	....	....	10·21	138·0
September	9	74	31·2	30	53·37	12	3·34	....	....	3·34	91·2
October	7	72	28·2	16	44·94	17	2·74	....	....	2·74	87·0
November	11	59	10·2	29	30·92	9	2·94	20·3	8	4·97	26·2
December	7	47	-13·2	14	16·83	7	1·04	20·2	10	3·06	39·5
1913.											
January	18	43	-22·2	29	31·32	7	2·42	45·4	19	6·96	47·8
February	1	41	-19·9	6	4·80	2	0·17	25·3	9	2·70	78·2
March	22	52	-14·9	8	21·91	9	2·80	23·0	10	5·10	67·5

EXPERIMENTAL FARM FOR MANITOBA.

BRANDON, MAN.

The season of 1912-13 was one of extremes. Spring was cold and backward; a heavy snowfall in the middle of April delayed the commencement of seeding, and frequent light showers kept the land unfit for cultivation, and made all crops late in being sown. Next followed a period of extreme drought; June was the driest month in the history of the Farm. July went to the other extreme again, with an unusually heavy rainfall. Wet conditions continued until the end of September, and greatly hampered harvesting and threshing, and lowered the quality of the grain crops. October and November were fine, and gave a most acceptable opportunity for catching up with the sadly-delayed farm operations. The winter season was about normal, with the usual amount of cold weather and snow.

EXPERIMENTS IN AGRICULTURAL METHODS.

The work in comparing rotations of crops has progressed during the year. Over half of the arable land of the Farm is now laid out in rotation fields, and seven different rotations are now in operation; an eighth has had a block of land allotted to it, but work will not be started thereon until 1913. It is too soon to report any definite results from the work, but even at this early date in the test, some noteworthy facts stand out, such as the value of corn in a rotation, the profit from the use of manure, and the possibility of growing a crop every year, through using a suitable rotation.

The system of cultural experiments, inaugurated in 1911, has been brought more nearly to full working order, but as some of the experiments take from two to four years in preparation, all are not in full operation as yet. The work for the season of 1912 was all done in a thorough manner. Results for this season have been rather disappointing; there has not been the difference in yield between what are generally supposed to be good and bad methods, that would be expected. Perhaps this was due, at least in part, to the wet weather in July, which forced all crops to grow, whether they were in properly prepared land or not.

VARIETIES OF GRAIN.

The usual tests of varieties of cereal crops were conducted this year. Four named varieties of wheat were tested and, in addition, ten new sorts, received from the Dominion Cerealist, under number, were given a trial. A comparison was made of eight different strains of Red Fife, secured from different seed merchants and seed growers, to ascertain what source of this variety offered Manitoban farmers the best seed. Sixteen varieties of oats, ten varieties of six-rowed barley, seven varieties of two-rowed barley, eight varieties of flax and ten varieties of field peas were tested in uniform test plots.

Quantities of seed grain, of a number of the best varieties, were grown for distribution by the Dominion Cerealist, and for sale in small quantities.

The season was an unfavourable one for experimental work with grains. The extreme drought followed by extreme wet caused a heavy second growth in all the earlier crops; wet harvest weather increased the difficulties, so that the results obtained are not, in all cases, typical of the usual results obtained from the different varieties.

FIELD ROOTS AND FORAGE CROPS.

Excellent crops of field roots were obtained this season. The wet weather of late summer and early autumn just suited them. These crops deserve more general cultivation in this province. Tests were made of fourteen varieties of turnips, eight varieties of mangels, seven varieties of sugar mangels or sugar feeding beets, three varieties of sugar beets for sugar production, and six varieties of field carrots.

Indian corn was not as good a crop as usual, on account of the low germination of seed and unfavourable conditions at time of planting. However, yields were obtained which amply justified the growing of the crop. Tests were made of ten different varieties of corn for fodder. The crop was stored in the silo as usual, and made a great bulk of very excellent feed.

The crop of hay, grasses and clover was rather short, as it was injured by the June drought. Alfalfa was much better able to withstand the dry weather, and produced two very good cuttings. A set of twenty-eight plots of grasses, clovers, alfalfa, and mixtures, sown in 1911, produced crops this season which gave an interesting comparison of the productiveness of the different sorts.

LIVE STOCK.

The herd of cattle consists chiefly of the milking type of Shorthorn. The milk records show that, while these cattle cannot equal the regular dairy breeds in milk production, they do much better than the ordinary cattle of the country. At the same time, they are capable of producing offspring of reasonably good beef type. From December 19th, to January 18th inclusive, one of these cows gave 1,810½ pounds of milk. Great interest is taken in this type of cattle by the farmers of Manitoba and the other western provinces, and there is quite a keen demand for young stock. All the males and the surplus females are sold to farmers at low rates. In addition to Shorthorns, two Ayrshire females and two grade females are on hand.

An experiment in feeding steers outdoors, as compared with stabling, was completed in May, 1912. As in previous experiments of this nature, outdoor feeding was proven to be practicable and profitable. In November, 1912, a carload of steers was purchased, in order to continue the steer-feeding experiments. This year all the steers are being fed outdoors, but some receive alfalfa in place of part of the grain ration. The experiment is not completed at the time of writing.

The flock of ewes has done well during the season, and has produced a good crop of lambs. A hundred range lambs were purchased in November, 1912, for the purpose of conducting a feeding experiment. One night in January, dogs attacked them and worried them so badly that thirty-three of them were killed or injured so seriously as to necessitate their being killed. The remainder were so upset by fright and lesser injuries, that the experiment was rendered entirely valueless.

A small number of Yorkshire and Berkshire swine are kept; they have done well during the season. A feeding experiment was conducted to compare the feeding values of barley and shorts. The result proved a victory for the barley.

A sufficient number of horses are kept to do the work of the Farm. No experiments have been conducted with horses, and very little breeding.

HORTICULTURE.

Twenty-three varieties of potatoes were tested in uniform test rows, and were also subjected to a cooking test. Tests were also made of the effect of various commercial fertilizers on potatoes. The usual variety tests of all the different kinds of garden vegetables were also conducted. Garden crops were fairly successful, yielding abundant crops, in most instances, but being rather late.

The usual display of flowers was made, and was greatly admired by numerous visitors. Sweet peas were specialized in, and fifty-seven varieties were in bloom at one time.

No additions were made to the arboretum. Notes were taken as usual on the growth, hardiness and other characteristics of all the different kinds of trees and shrubs.

Additions were made to the fruit orchard by purchasing trees of promising varieties of apples and plums from several nursery firms, and planting them out in the place of other trees that had died or proven unsatisfactory. A good crop of native plums was harvested, and quite a number of cross-bred apples, of very good quality and fair size, were produced. Three thousand young apple seedlings of standard varieties were received from the Dominion Horticulturist, and planted out in nursery rows. A new plantation of bush fruits was set out. Specimens of the most promising varieties of black, red and white currants, gooseberries and raspberries are included in the plantation.

POULTRY AND BEES.

Small flocks of hens, of Barred Rock and Silver Grey Dorking breeds, are kept. No experimental work with poultry has been done during this year. The birds have been healthy and have laid reasonably well.

The bees wintered satisfactorily, and ten hives were taken out in the spring. During the summer there was a greater interest shown in bees than usual. Six hives were sold, and more would have been taken if they could have been spared. Fifteen hives were stored away in winter quarters. The cold dark season was unfavourable for honey production and the quantity stored was not as great as usual, but was of the usual excellent quality.

EXCURSION.

On July 3, 1912, an excursion was run to the Experimental Farm by the Virden Agricultural Society. The train started at Elkhorn and received passengers at each station between that point and Brandon. This is the first excursion to this Farm for many years. About 200 persons took advantage of the excursion.

DISTRIBUTION.

During the year, the following distribution was made: 367 samples of seed potatoes, 35 bundles of trees and cuttings, 22,200 pounds of inoculated soil for alfalfa.

VISITORS.

During the year about 9,000 visitors inspected the Farm.

METEOROLOGICAL RECORD FOR BRANDON.

Months.	Highest Temperature.		Lowest Temperature.		Mean Temperature.	Total Rainfall.	Total Snowfall.	Hours. Bright Sunshine.
1912.	Day.	Deg.	Day.	Deg.	Deg.	Inches.	Inches.	Hours.
April........	4	71.9	14	14	41.2	.86	7	226.4
May........	26	84	13	21	51.5	2.94	....	208
June	30	101.5	5	35	62.1	24	....	224.9
July.........	1	97.8	18	36	61.3	6.46	. ...	166.3
August.	11	82.1	3	38.4	59.9	1.17	....	118.1
September...	3	80.2	25	18.5	49.8	3 46	....	126.5
October......	4	75.4	22	16	41.6	.24	....	137.8
November....	18	54.6	27	5	29.2	. ...	1	85.1
December....	27	39.9	8	-27	9.3	....	10	61.1
1913.								
January.....	28	36.9	12	-37.6	-8.5	....	11	73.6
February....	13	32	26	-38.6	-3.8	....	6	112.4
March.	30	46.4	2	-29.7	7.7	....	5	148.2
						15.37	*40	1688.4

*Reckoning 10 inches of snowfall as equivalent to 1 inch of rainfall the total precipitation for the year ending March 31, 1913 was 19·37 inches.

EXPERIMENTAL FARM FOR SOUTHERN SASKATCHEWAN.

Indian Head, Sask.

The winter of 1911-12 was remarkable for little snow, few storms and exceedingly cold weather in January. The winter of 1912-13, just passed away, has been noted for fine weather up to the end of the year, few storms, considerable snow, and the usual cold January.

Seeding commenced early in April, with both weather and soil conditions favourable. On the Experimental Farm, wheat was sown on April 8, peas on the 9th, barley on the 25th and oats on the 29th.

Fall-rye, fall wheat and Prelude spring wheat were cut on August 5, barley on the 12th and oats on the 14th. All wheat, oats and barley were in stook by the last of the month, excepting a few acres of late oats. Threshing commenced on the

Experimental Farm on September 3, with fall rye and fall wheat and, after many delays from unfavourable weather, was completed on October 9. Rains discoloured the barley after being in stook, and injured the wheat sample considerably.

With few exceptions, all grain crops gave excellent returns last year, those from the experimental plots exceeding those of any previous year in the history of the Farm. Marquis heads the list of wheats in yield, while Prelude is first in earliness, being from twenty to twenty-five days earlier than Red Fife, which has in the past been the variety chiefly grown in the West. Fall wheat, which is usually a failure in southern Saskatchewan, gave a good yield, though the sample was only fair. Oats did well on summer-fallow, and an average return was obtained on stubble land. Barley yields were all satisfactory excepting two varieties, which were only fair. Peas were overtaken by frost before maturing and both yield and quality were injured.

The hay crop did not equal that of 1911, on account of the dry weather in June checking the growth of the first cutting. Wet weather at the time of cutting made the task of saving the crop more difficult than usual. In the experimental work with grasses and clovers, the chief point worthy of notice was the small yields of hay obtained where the seed was sown with a nurse crop. In Rotation 'R,' where the grass and clover seed was sown with oats, the yield was only 880 pounds per acre, and in Rotation 'P,' 1,794 pounds. In the cultural tests the yields were much better, but still below those plots where the seed was sown alone.

Corn, roots and potatoes were especially good the past year. Carrots and sugar beets, although small in yield, as is usually the case here, were of excellent quality.

SUMMARY OF CROPS EXCLUSIVE OF UNIFORM TEST PLOTS.

	Acres.	Yield.	
		Bush.	Lb.
Wheat	73.25	2,099	26
Oats	57.07	4,267	29
Barley	37.44	2,124	43
Peas	8.16	338	40
Fall rye		39	00
Flax		98	40
Fall wheat		6	45
Potatoes		172	00
Roots		5,000	
		Tons.	
Corn ensilage		110	00
Rye grass		19	00
Rye grass and clover		10	00
Alfalfa		24	00
Hay cut in coulees		10	00

Vegetables, with a few exceptions, were satisfactory. Beans failed to mature before being caught by frost. Corn, the squaw variety excepted, shared the same fate. Melons were a failure, while tomatoes had to be gathered before fully matured. Beets, cabbage, cauliflower, celery, carrots, etc., were, as they always have been, very satisfactory.

Last year was particularly favourable for trees; although spring frost killed a large part of the blossoms, no injury or set-back to the trees took place, and all made a large growth and matured the wood during the long season.

Shrubs did exceedingly well; lilacs, caraganas, honeysuckles and other flowering sorts were conspicuous by the large quantity of bloom.

As usual the flower beds were prolific in bloom and beauty. In annuals, asters, verbenas, petunias, stocks, and pansies were very conspicuous; and in perennials, dahlias, gladoli, paeonies, and tulips have seldom been surpassed.

Late spring frost caught the crab-apple and plum blossoms before the fruit was set, and the crop was not large, although good.

In small fruits, currants and raspberries were never better; while gooseberries and strawberries were a failure, chiefly caused by the late spring frost.

A large number of seedling apple trees were set out last spring, and made a satisfactory growth during the season.

During last spring four registered mares were purchased, with the intention of raising sufficient colts to replace old and worn-out animals. Only one mare is with foal, although all were bred. At present eleven heavy work horses, and two light horses are on hand.

The herd of cattle on the Farm at present consists of thirty-six pure-bred Shorthorns, and four grade animals.

The flock of sheep consist of one pure-bred Shropshire ram and three pure-bred ewes, in addition to eleven grade ewes.

There are at present on the Farm, two pure-bred Yorkshire White boars, four pure-bred Yorkshire White brood sows, one pure-bred Berkshire boar and one pure-bred Berkshire brood sow.

Two breeds of poultry are kept on the Farm, and the flock at present consists of twenty-nine Barred Plymouth Rocks and twelve White Wyandottes.

During last year an enlarged horse stable, replacing the one destroyed by fire in the winter of 1911-1912, was erected, but not entirely completed when severe weather stopped the work. The building, which has been occupied since the new year, is 70 x 32 feet, the bottom story being cement, and the top, lumber.

The silo, which was partly destroyed by fire, was rebuilt in time for the corn crop in September. Four feet were added to the length of the staves, making the height thirty instead of twenty-six feet.

A long-felt want in the way of granary room was supplied last year in the erection of a building 26 x 50 feet x 8 feet high, the foundation and floor being made of cement.

A building 24 x 44 feet, and 12 feet high, was put up during the year, to hold the large machinery, such as threshing machines.

On account of delay in obtaining the necessary plans, etc., the large barn could only be commenced, when cold weather stopped the cement foundation work.

A new office building was erected early in the season and occupied late in June. The size is 20 x 25 feet, one and one-half stories high, giving ample room for the increased work on the Farm.

During the season, as opportunity occurred, trees, hedges and shrubs were removed, where they were too numerous, about the Superintendent's house and along the driveways, with the intention of having more open space and lawns. The rotation experiments commenced in 1910 and the cultural tests commenced in 1911 were carried on during the past year. The most notable result obtained in the rotation tests was the poor returns received in seeding grass seed with a nurse crop.

Mr. Robert Whiteman, B.S.A., had charge of the cultural experiments this year.

DISTRIBUTION OF SAMPLES.

A distribution of samples of products of the Farm was made in the spring, chiefly to residents of Saskatchewan. The following is a list of the samples sent out:

Potatoes, 3-lb. bags, mailed to Ontario and Quebec, 1,383.
Potatoes, 3-lb. bags, mailed to Saskatchewan, 1,405.
Garden peas, 1-lb. bags, 139.
Garden corn, 1-lb. bags, 139.
Small seeds, 131 packages containing 1,310 packets of flower and shrub seeds.
Tree seeds, maple, 249 packages of 1-lb. each.
Tree seeds, ash, 255 packages of ½-lb. each.

Tree and shrub seedlings, 329 packages containing 75 trees each.
Express parcels containing trees and shrubs, 15, of 50 trees each.
Crab-apple and plum seedlings, 60 packages containing 12 trees each.
Rhubarb roots, 96 packages containing 6 roots each.

Inoculated soil:—201 packages of 100 lbs. each were taken from one of the old alfalfa fields, and shipped to residents in the province, the applicants paying freight charges and cost of bag.

VISITORS.

During the past summer, 2,234 men, women and children visited the Farm. A good many were from the town, and walked or drove through the grounds on Sundays. The students from Regina College paid the Farm a visit on June 22, and the Normal School students from Regina, about 150 in number, visited the Farm on September 12. No excursions were run to the Farm last year on account of having no large buildings in case of rain.

METEOROLOGICAL RECORDS.

Month.	Temperature.					Rainfall.		Snowfall.	Sunshine.
	Maximum.		Minimum.		Mean.				
	Date.	Degrees	Date.	Degrees	Degrees.	Days.	Inches.	Inches.	Hours.
1912.									
April	21	78	5	12	40.60	5	.40	3.	194.5
May	25	81	4	22	49.45	13	3.66	....	155.8
June	27	97	15	34	61 63	8	1.42	....	278.5
July	24	90	14	39	60.29	14	3.42	....	141.2
August	10	80	29	39	59.71	9	2.17	....	130.3
September	18	74	24	22	46.23	8	1.98	....	117.8
October	1	80	18	20	39.93	3	.25	1.	113.8
November	9	61	27	8	29.40	....	....	3.50	84.3
December	9	39	8	19	13.19	....	....	12.25	53.2
1913.									
January	28	40	20	45	6.51	....	....	8.	57.9
February	16	40	26	35	1.50	....	....	13.	63.1
March	31	45	1	31	10.58	....	....	11.75	121.
Totals	....	....	....	....	....	60	13.30	*52.50	1.511.4

* Reckoning ten inches of snowfall as equivalent to one inch of rainfall, the total precipitation for the year ending March 31, 1913, was 18.55 inches.

EXPERIMENTAL STATION FOR CENTRAL SASKATCHEWAN ROSTHERN, SASK.

WEATHER CONDITIONS, 1912-13.

The season opened under normal and favourable conditions, and seeding was begun on April 10. All crops made good growth until early in June, when dry weather set in, crops that had not a goodly supply of soil moisture suffered greatly, and even those under the most favourable conditions suffered to a very appreciable extent. Showery weather prevailed until nearly the middle of May, and hay crops especially

were very promising, but with the continued dry weather until late in June the meadows of two years' standing, or longer, became yellow and did not fully revive again all summer. In the months of July, August and September, there was more than average precipitation, which had a peculiar effect upon the grain crops. The plants had adapted themselves to the dry weather conditions of June by stooling very little, but with the heavy rains in July the stools developed and, at harvest time, there was the unusual circumstance of several stages of development in the plants of any one plot and, in many cases, in the heads of grain of one plant. Some of the wheat was ripe while other heads in the same plant were in blossom. This condition of irregular growth worked to the disadvantage of the farmer at every stage. In the first place, there was no means of determining the best time to cut; after cutting, the green straw delayed the drying of the grain; at threshing, a great deal of the undeveloped grain blew out with the straw which very materially lowered the yield as compared with the yield promised from the stand, and at marketing, the presence of immature grain with the good grain lowered the grade.

Following are the meteorological records for the past year:—

METEOROLOGICAL RECORDS.

Month.	Temperature F.					Precipitation.		Hours of Sunshine.
1912.	Date.	° Max.	Date.	° Min.	° Mean.	1911-12	1912-13	
April	11	63.	15	16.8	39.21	0.86	.67	251.4
May	27	84.2	20	28.2	48.5	2.38	2.20	246.7
June	23	93.8	16	34.0	61.88	3.55	2.81	363.7
July	30	76.2	16	38.2	57.7	2.89	5.25	164.9
August	23	79.2	30	37.2	58.6	1.79	2.15	192.2
September	12	73.2	28	20.6	45.74	1.81	2.76	133.0
October	1	67.7	21	17.7	38.48	0	0.22	107.4
November	18	41.0	29	0	23.99	0.90	0.82	64.2
December	27	38.8	11	-23.2	8 15	0.85	0.5	62.4
1913.								
January	29	38.6	20	-49.5	13.3	0.30	0.55	73.9
February	17	35.0	26	-34.0	0.6	0.30	0.32	103.8
March	8	41.1	1	-33.8	4.25	0.60	0.35	160.3
Totals	....	....	....	....	....	16.23	18.60	1923.9

EXPERIMENTAL WORK.

The work begun in 1911 under the heading of Cultural Investigation Work, was continued in 1912, but as such work requires time to collect reliable results, very little can yet be deduced from most of the experiments. In the work begun at the same time on rotations, however, something can already be learned by studying the results of this work carefully. Allowing a fair market value for all crops produced, and a fair wage, and necessary allowances for wear and tear of machinery, rent of land and other incidental expenses, it will be seen in the first place, that the more the variety of crops, within certain limits, the greater is the return from the soil. Another notable feature in this work is the great returns obtained from somewhat more than ordinary cultivation. The returns from land poorly cultivated and sown to but one crop continuously show poor returns for the capital invested.

In the work on test of varieties, several new varieties of wheat bred by Dr. C. Saunders were under test, but none has shown any decided advantage over Marquis.

Attention is called to the work carried on with potatoes last season, and particularly the different yields obtained from different methods of planting and cultiva-

tion, the two most notable features being the high yields from deep planting as opposed to shallow planting and from level cultivation as opposed to ridging.

BUILDINGS.

The contract was let in September for a large barn, but because of danger of frost, work could not be continued on this, and there is still insufficient accommodation for the live stock. There is also need of space for grain, and particularly for the variety samples.

DISTRIBUTION OF SAMPLES.

In the spring of 1912 there were 176 samples of potatoes sent out, besides a number of samples of caragana, maple and ash seed.

WATER SUPPLY AND SEWAGE DISPOSAL.

In the report of 1910 the water supply system and the sewage disposal system were described, and now, after 3½ years of continuous trial, their efficiency has been proven. The only mistake that was made was in the laying of the tile drain, leading from the septic tank to the cesspool, 7 feet deep instead of 9 feet. At 7 feet the pipe froze in the winter of 1911, and in July of that year was laid two feet deeper, since which time it has continued to do efficient service.

THE GROUNDS.

The work in the horticultural department was considerably extended in 1912, and in March of this year (1913) the services of an experienced gardener were secured.

EXPERIMENTAL STATION FOR NORTHWEST SASKATCHEWAN.

Scott, Sask.

CHARACTER OF SEASON.

The crop season of 1912 opened favourably. Work on the land commenced with harrowing on the 11th day of April, and on the 13th the varieties of spring wheat were sown. The soil was in good condition and, generally, the seed went into a favourable seed bed. After seeding, germination was uniform, and the grain crops had a good start. During May, the rainfall was moderate, amounting to 2·46 inches. In June, the precipitation was 2·19 inches. This low rainfall for June was associated with hot weather, which tended to hasten early varieties of grain towards maturity, at a sacrifice of yield. In July, a very heavy rainfall was recorded, totalling 6·16 inches. This amount of moisture, coming late in the season, benefited the slower-maturing grains to some extent. However, a second growth was so encouraged that the sample, in many cases, was marred by the immature grain appearing among the good. The length of the growing season made it possible for all crops to mature, September 15 being the date of the first damaging frost.

In this part of Saskatchewan, the crops in 1912 were good. On account of other unfavourable conditions, however, the year rates as a poor one from a grain-grower's standpoint.

The open season for fall work was short, the plough being stopped by October 31. Owing to the scarcity of labour (all of which was required for threshing opera-

tions) very little was accomplished with cropped land, by way of soil preparation, for the seeding of 1913. After the ground froze up, considerable good weather was experienced, which permitted threshing to be completed on the majority of farms throughout this district. Following on this fine period of early winter, January proved the coldest month of the year, resembling closely the same month in 1911. After twenty-four days of steady cold, the weather moderated and the balance of January, with February, was favourable winter weather. March was a month of good cold weather up to the 27th, when spring conditions obtained control. The snowfall for the winter of 1912 and 1913 was light. However, seeding prospects for 1913 (in view of the depth of frost, and the moisture in the soil from the two preceding rainy seasons) are bright.

WORK CARRIED ON DURING YEAR.

During the year, on the Experimental Station, the regular work in farm crops and horticulture was carried on. Very satisfactory results were obtained in the majority of tests. Results of special note were observed in crops of well-matured field peas, good yields of barley, and heavy returns with oats. Potatoes and turnips gave good yields of tubers and roots of excellent quality. Also, the flower border was very pleasing, in a beautiful, persistent bloom, which extended over several weeks of the season.

For horticulture, the area was enlarged, and considerable stock of a permanent nature was added; sample hedges, an arboretum and a new orchard were started. In November, a substantial and commodious implement shed was erected, near the barn. This building is 70 feet by 25 feet, with 10-foot studding at the back, and 12-foot studding in the front. The roof is a suitable design for spread and strength, and also permits of high doors. This roof has a peak formed by a 20-foot run and an 11-foot run of rafter; the short rafter is placed at the front. The shed is entered by three pairs of doors, 10 feet, 12 feet, and 16 feet in width. The centre pair slide on the inside of the wall, which allows all doorways to be open at the same time.

Two of the work mares, bred in 1911, reared foals in the season of 1912, which, from the first, have been thrifty and promise to make useful workers for the farm.

During the year, over 700 visitors were recorded at the Station. These received personal attention by some member of the staff. This visiting was confined largely to the summer months, when crops and growth of interest could be seen.

In the course of the year the Superintendent visited the Provincial Farm at the Agricultural College, Saskatoon, the Dominion Experimental Station, Rosthern, and the Provincial Winter Fair, held in Regina. He also attended the Saskatchewan Agricultural Societies' Convention, held at the university, Saskatoon.

WORK FOR THE PROVINCIAL EXTENSION DEPARTMENT.

H. C. Love, gardener at the Scott Station, officiated as judge of vegetables, grains, and grasses at the Summer Fair, Unity, July 31. At a ploughing match of the Wilkie Agricultural Society, on June 18, the Superintendent acted as judge. He also attended as judge of horses in July and August at the following fairs: Kindersley, Zealandia, Luseland, Brock, Outlook, Brownlee, and Hanley. On March 29, 1913, he addressed a meeting of farmers in the Cut Knife Hall, on Diversified Farming, and, following this, conducted the organization of the Cut Knife Agricultural Society.

METEOROLOGICAL RECORDS.

Month.	Temperature F.					Precipitation.	Sunshine.
	Maximum.		Minimum.		Mean.		
1912.	Date.	Degrees.	Date.	Degrees.	Degrees.	Inches.	Hours.
April	29th	68·5	26th	12·2	40·65	Not any.	235·9
May	15th	85·0	12th	24·7	49·41	2·46	255·5
June	22nd	95·5	4th	28·7	61·71	2·19	343·0
July	31st	88·0	14th	34·2	58·00	6·16	183·5
August	9th	81·0	30th	32·9	59·74	2·93	192·5
September	11th	74·5	28th	15·7	45·64	2·01	132·7
October	1st	75·0	31st	14·2	39·09	·15	161·0
November	17th & 18th	47·0	29th	8·2	27·00	·20	84·9
December	1st	44·1	5th	−19·8	16.86	·27	91·3
1913.							
January	28th	38·8	20th	−48·8	−9·47	·59	83·9
February	15th	38·8	3rd	−35·4	3·33	·42	104·4
March	31st	46·0	1st	−35·6	11·08	·23	157·4

EXPERIMENTAL STATION FOR CENTRAL ALBERTA.

Lacombe, Alta.

THE CLIMATIC CONDITIONS.

Seeding commenced on the 15th of April, which is an average for earliness. Germination was prompt, growth rapid, but maturity was delayed and harvest operations interfered with by an unusually heavy rainfall. The precipitation for the year totals 23·64 inches, and is the heaviest on record. There was little snow throughout the winter, there being good sleighing for a week in March.

METEOROLOGICAL REPORT.

Months.	Highest Temperature. F.	Date.	Lowest Temperature. F.	Total Precipitation.	Total Hours Sunshine.	Date Lowest Temperature.
1912.	°		°			
April	63·3	8th	17·9	1·26	196·2	6th.
May	82·7	14th	23·5	2·92	232·9	10th.
June	89·6	26th	25·5	3·00	304·0	3rd.
July	78·5	30th	30·4	5·29	177·1	16th.
August	84·5	22nd	30·0	4·44	177·7	30th.
September	75·8	11th	20·8	1·27	175·2	24th.
October	70·6	11th	13·6	1·56	147·5	31st.
November	58·3	17th	2·9	·93	88·5	30th.
December	58·6	8th	−10·6	·08	74·2	1st.
1913.						
January	45·3	28th	−35·5	·93	63·3	11th.
February	55·6	15th	−28·6	1·15	103·2	26th.
March	52·1	8th	−23·6	·81	164·1	19th.
Total				23·64	1903·9	

VARIETIES OF CEREALS.

With the view of securing definite information as to the adaptability of varieties of grains for this climate, tests of various numbers of those considered most likely to succeed have been carried on during the past six seasons. From the results of these tests, the following varieties may safely be recommended as suitable for districts similar to this in soil, precipitation, altitude and temperature:—

Spring Wheat.—Marquis, Prelude (when seed is available), and Huron.
Winter Wheat.—Kharkof and Alberta Red.
Oats.—Banner and Abundance.
Six-Rowed Barley.—O.A.C. No. 21 and Mensury.
Two-Rowed Barley.—Standwell and Hannchen.

CULTURAL WORK.

The cultural work has been carefully carried on during the year. Already sufficient data have been secured from these experiments, which were first systematically organized two years ago, to indicate that the information gained therefrom will be most valuable. The experiment begun for the purpose of securing information concerning the best method of seeding down to grass and clover is giving decided differences in yields of hay. The experiment, having in view the answer to the question, 'What is the best method of summer-fallowing' is showing big differences in yield of grain. Thus, this line of experiments, comparatively recently instituted as they are, and admitting that as yet it is too early to draw conclusions, is, nevertheless, showing sufficiently definite results to warrant the confidence that this work will be productive of much useful data.

ALFALFA.

This crop may be satisfactorily grown in Alberta. From experiments made at Lacombe, two things are indicated as necessary: (1st), a hardy strain, and (2nd), inoculation of the soil. The hardy strains here are Grimm and Turkestan. One hundred pound of inoculated soil may be obtained from the Lacombe Station for any district north of township twenty-four and west of the fourth meridian, freight prepaid to destination, for one dollar.

ROTATIONS.

A number of rotations have been under way for two and three years. The value of these rotations is being compared from two standpoints: (1st), economy of production, and (2nd), maintenance of soil fertility. The answer to the first may be secured from the cost data, an accurate account of which is kept, and the second will be answered by comparison of chemical analyses. The first analysis was made from soil before commencing the rotations, and subsequent analyses will be made from soils taken from time to time, after the rotations have been under way long enough to affect the chemical constituents of the soil. These figures will enable a farmer to determine the desirability of a rotation from the two important angles, cost of crops under any given system, and the life of his land under that system.

SUMMARY OF CROPS EXCLUSIVE OF UNIFORM TEST PLOTS.

—	Acres.	Yield.	
		Bush.	lb.
Wheat	12.783	380	54
Oats	88.407	5066	23
Barley	23.996	1218	00
Peas	·25	4	00
Potatoes	3.723	834	00
Roots	2.606	144	
Hay—		Tons.	lb.
Timothy	55.0	65	00
Brome	19.0	15	00
Alfalfa	5.425	9	16
Mixed Hay	17.586	28	1651
Green Feed	25.0	35	00

SMALL FRUITS AND ORCHARD.

Small fruits are succeeding well. Black currants have this year produced large yields of excellent quality. Strawberries, if given protection by shelter belts or bluff, will yield well. The varieties leading, for a period of years, are Haverland, Senator Dunlap and Bederwood, while Warfield and Wm. Belt stood highest in 1912.

A large number of seedling apple trees, grown from seed of hardy stock, have been planted this year. The growing of trees produced from seed of hardy varieties of good quality affords the quickest solution to the problem of securing suitable stock for our climate.

ORNAMENTAL TREES AND SHRUBS.

With the idea of providing an object lesson in methods of grouping ornamental trees and shrubs, the grounds between the Superintendent's residence and the Calgary and Edmonton trail were laid out and have been partially planted, under the direction of the Dominion Horticulturist. The remaining work will be completed in the spring of 1913.

EXTENSION.

In March of 1912, the Honourable the Minister of Agriculture authorized the purchase of some three hundred and sixty acres additional land. This area was secured in order to give more scope for the horticultural and cereal work already under way, and to provide range and winter forage for live stock, which had not hitherto been kept. The district which the Station serves is well adapted for live stock. and there is a large field for work along that line.

BUILDINGS.

To provide accommodation for stock, a dairy barn, a beef barn and a storage barn, were erected, which will hold the fodder for, and house, about one hundred head of beef and dairy sows and young stock. The dairy barn is a one-storey structure with the aisle opening into a feed-room in the storage barn, with which it forms an 'L.' Concrete foundations and floors have been provided, while care has been exercised to secure an abundance of light and good ventilation.

A dairy in which to manufacture butter and cheese from the milk produced on the farm has been built. This building has a deep well in connection, from which water for the stock is secured.

A six-room cottage for the herdsman has been built.

An ice-house of about eighty tons capacity was also erected.

HORSES.

Ten mares were purchased during the year. A few of these are registered; both Clydesdale and Percheron blood is represented among the pure-breds secured.

CATTLE.

Eighteen Aberdeen Angus were purchased. The herd now numbers twenty, and is headed by 'Elm Park Ringleader 7th,' -2861-117826, a bull of good quality and one which has already proved himself as a sire.

Twelve head of Holstein-Friesian cattle were purchased. The herd is headed by 'Royalton Korndyke Count' (88884), a young bull of great promise and excellent pedigree.

The cattle on the farm have been increased from four to sixty-three during the past twelve months.

SWINE.

Four Yorkshire sows and one Berkshire sow represent the breeding stock of hogs at present.

POULTRY.

A start was made in March, 1913, toward establishing a poultry plant. Barred Rock, White Wyandotte, Buff Orpington and Rhode Island Red hens will be kept, and special attention given to the development of egg production. Toulouse geese. Pekin ducks and Bronze turkeys will also be kept, and small flocks have already been established.

FEEDING FOR BEEF.

Three groups of steers, evenly divided in regard to age, initial weight, quality and breed, have been fed during the winter of 1912-13. These cattle were of various ages, from almost two to over three years, and each group contained twelve head. A fourth lot, consisting of thirteen head, was left over after having divided the three groups and making a uniform cut, and this lot was also fed. This group was handled in exactly the same manner as group number three, and the results of this part of the experiment need little consideration, except in that they show that profits can scarcely be hoped for, when cull steers are being fed. This inferior group sold at six cents per pound, straight weight, after having been on feed for the same length of time, and having consumed, approximately, the same quantity of feed as those better groups which brought about seven and one-half cents per pound, subject to a five per cent shrink, on the same date of delivery. The Swift Canadian Company were the purchasers of the cattle, shipping them to the coast. A number of young cattle included in this year's feeding tests made very satisfactory gains, showing the advisability of securing cattle with good breeding and of good size for their age when purchasing feeders. A few of the younger cattle, of inferior breeding, made losses.

The manure produced by the steers on feed has been estimated to be sufficient to pay for the labour in connection with feeding them. The quantity produced by

the twelve steers fed inside amounted to 140,400 pounds. Experiments which have been conducted at the Lacombe Station with the view of ascertaining the value of barnyard manure, show that it is well worth $1 per ton, applied. The cost of applying manure from the yards to the fields is less than twenty-five cents per ton. It is therefore fair to credit the cattle with the manure produced by them at seventy-five cents per ton in the yard. Those who are not in a position to realize on the fertilizer value of manure, would necessarily charge labour against cattle they have undertaken to feed, at current wages.

The three groups were fed on exactly the same feeds, but were given different accommodation. Group No. 1 was fed in the barn in box stalls, which were kept well bedded and cleaned at regular intervals. They were not let out at all except once each month for the purpose of being weighed. They had water twice a day, though it was before them practically throughout the day. They were fed straw in their mangers as well as green feed and hay during the last three weeks of the feeding period, as were also the other two groups.

Group No. 2 was fed in the corral, having but a very limited run, being confined near the buildings. These steers had water before them at all times and were fed their roughage in the feeding racks about the corral. They got their straw at the straw stack. The water in the tank was kept free from ice by the use of a tank heater.

Group No. 3 was fed in the bluff toward the western boundary of the farm; they were at liberty to run free practically over a half section of land with access to the straw stacks and were fed green feed on the ground. They watered at a small lake, through the ice.

The grain mixture used for the steers this year consisted of wheat, oats and barley mixed in the proportion of one-fifth wheat, two-fifths oats and two-fifths barley, finely ground. The chop was charged at one cent per pound, the green feed at $10 per ton, hay at $10 per ton, salt at cost, and the straw consumed per head has been estimated at one ton per steer, and charged at $2 per ton.

Group 1 required 261 hours 30 minutes labour to attend to them for 109 days; group number 2, 64 hours 15 minutes labour; and group number 3, 58 hours labour to attend to them for the same lengths of time.

No charge has been made against the group of cattle fed in the barns for shelter. The experiment considered only the economy of gain in each case. The charge for shelter, if made, would be about $4 per head.

Group number 1 made an average of 1·53 pounds daily gain, consumed 1,078 pounds of hay and green feed, 1,019 pounds of chop, and (estimated) 1 ton of straw. The feed cost: $5.39 for the hay and green feed, $10.19 for chop, and $2 per head for straw. The average profit per head on this group was $10.95.

Group number 2 made an average daily gain of 1·79 pounds; consumed 1,122 pounds of hay and green feed, 1,032 pounds of chop, and (estimated) 1 ton of straw. The feed cost $5.61 for hay and green feed, $10.32 for chop, and $2 per head for straw. The average profit per head on this group, after paying the above costs of feed, was $14.05.

Group number 3 made an average daily gain of 1·34 pounds; consumed 994 pounds of hay and green feed, 949 pounds of chop, and (estimated) 1 ton of straw. The average profit per head on this group was $10.15.

Uniformly satisfactory profits on the feeding of steers have now been made for years in succession. By feeding the grain to cattle, we have secured a market for grain as beef, at a much higher price than could have been secured for number one grades of grain sold through the elevator.

The grip of necessity is forcing in upon the mind of the grain grower a vivid realization of the need of directing his energies along more varied lines, and of keeping live stock to insure a satisfactory outlet for either high or low-grade grain.

EXPERIMENTAL STATION FOR SOUTHERN ALBERTA.

Lethbridge, Alta.

The season of 1912 resembled that of 1911 in that the rainfall during the early part was deficient, while during the latter part the usual amount was received.

The results of the crops on the Station during the summer of 1912 have been interesting although, in many instances, somewhat disappointing. The season opened up in a most propitious manner. Work on the land began on March 28 and the first seeding was done on April 1, although it would have been possible to have begun a little earlier. The soil was left moist from the fall of 1911 and the land was in excellent shape to work in the spring, consequently, the grain crops, in fact all crops, were put in under exceedingly favourable conditions where land had been prepared the summer or fall previous. However, the rainfall during April, May and until the end of June, in the immediate vicinity of Lethbridge, was extremely light. Although grain sown on summer-fallowed land and on very early spring ploughing, where the land was cultivated immediately afterwards, came up well because it was possible to sow the seed in moist soil, germination on land that had not been so treated was not good.

On account of the previous season closing up so early in the fall of 1911 it was impossible for the farmers in southern Alberta to do much fall ploughing, the result being that a great deal of grain was 'stubbled in' this past spring, and most of this, in the Lethbridge district, germinated poorly.

The rainfall was very light, indeed, until the last few days in June; from then on during July, August and September, it was above normal. On account of this light rainfall during the first part of the growing season, all early-sown crops and especially winter wheat suffered acutely. Crops that looked extremely promising early in the season gave but low yields. Late-sown crops, on the other hand, did much better, providing they ripened before the frost.

The yields of all the crops on the non-irrigated portion of the Station were rather low, with the exception of peas and such late-growing crops as turnips, potatoes, etc.

On the irrigated portion of the Station, however, where water was applied in June, and in some cases even in May, the yields were very much more satisfactory. In the case of hay, however, especially alfalfa, it was found that the rainy season was rather difficult to operate in as it was hard to get the hay cured properly. Alfalfa usually makes its most rapid growth when supplied with the necessary moisture during the hot weather of July and August, but this year, on account of the many showers during this period, the weather was not as hot as it ordinarily is, so that alfalfa fields did not produce quite as much as they usually do.

CUT WORMS.

Considerable damage from these pests was again experienced and, unfortunately, the poisoned-bran treatment was not particularly effective. When ploughing early in the spring, specimens were occasionally noticed, but the first feeding by them that was observed was on May 6 which was between two and three weeks earlier than they appeared to show activity in 1911.

GENERAL OPERATIONS.

As usual, investigations were carried out on both the irrigated and non-irrigated land. The water used for irrigation was measured, as far as it was practical to do so.

A large number of varieties of oats, barley, peas and spring and winter wheats were tested. Experiments in rates of seed, and also dates of seeding with wheat, oats and barley were carried out. Flax was also put in at different dates, and our results would indicate that it would be profitable for farmers to sow this crop from one to three weeks earlier than they usually do. Tests were made with different varieties of turnips, mangels, carrots, sugar beets and corn. With forage plants, over 100 plots of grasses and mixtures of grasses and clovers were sown on both the irrigated and dry land to endeavour to obtain some data in regard to the best pasture grass or mixture of grasses.

In the horticultural department the usual number of varieties of vegetables and flowers were tested. The strawberries were injured by the frost of June 6, and the crop was a practical failure, from a commercial standpoint. Raspberries and currants yielded well; of the latter, the red and white bore quite satisfactorily, but the crop of fruit on the blacks was rather light. An apple, the first since the farm was started, was produced on a tree of Florence crab.

CULTURAL EXPERIMENTS.

The various experiments in cultural methods included under 'Prairie Breaking,' 'Depth of Ploughing,' 'Summer-fallow Treatment,' 'Stubble Treatment,' 'Seeding to Grass and Clover,' 'Breaking Sod from Cultivated Grasses,' 'Applying Barnyard Manure,' 'Green Manuring,' 'Seed Bed Preparation,' 'Soil Packers,' 'Depth of Seeding,' 'Commercial Fertilizer,' and 'Underdraining' were carried along successfully. Careful examination of the results reveals the fact that there is a much greater uniformity in the yields than might be expected, considering the diversity of treatment given the different plots in the various experiments, as to methods of cultivation. It is rather difficult to suggest a satisfactory explanation for this, unless it can be attributed to the rather unusual climatic conditions prevailing during the season, for the crops on all the plots began to show the lack of sufficient moisture soon after they were well up. As indicated in the table at the end of this report, the precipitation during April and May was very light, and during June only 0·71 inches fell up to the 27th of the month. This was not sufficient to maintain maximum growth even on land in which a good supply of moisture had been stored during the previous season by careful cultivation with this special object in view, consequently, the crops on all the plots suffered acutely up to the time the rains came. With the oats, a second growth started, which in most cases ripened, so that they yielded relatively better than did the wheat and barley.

The experiment in depth of seeding was interesting in that it seemed to throw some light on a rather controversial question, which is, whether it is advisable to sow grain deep or shallow in the early spring. As would be expected, the shallow-seeded grain came up first, but beyond this it did not seem to have any advantage over that sown three or four inches deep. It is often maintained, when the seed is planted deep, that an added strain is put on the plant by having to establish a secondary set of roots near the surface. So far as this year's results are concerned, there was nothing to indicate that such was the case. Under the conditions prevailing here, where we are subject to so much windy weather during April which dries the land out and drifts the surface soil, it is important to seed deep to obtain an even stand, if we can do so without detrimental results.

ROTATIONS.

In one or two cases, extra large yields were obtained from fields in the regular rotations. The field of turnips on the dry land rotation 'T,' sown on summer-fallow, yielded 25 tons per acre, giving a net profit, with turnips valued at $3 per

ton, of $49.82. The Grimm alfalfa, planted in rows in this rotation, yielded 135 pounds of cleaned seed per acre, which, valued at 40 cents per pound, gives a net profit of $46.39 per acre. In Rotation 'U,' which is on irrigated land, wheat, sown after roots, yielded 59 bushels per acre and gave a net profit per acre of $36.43, with wheat valued at 80 cents per bushel. In this same rotation, potatoes, planted on alfalfa sod freshly broken, gave a yield of 757 bushels per acre, which made a net profit of $307.38, with potatoes valued at 50 cents per bushel.

STOCK.

No breeding stock has been kept on the Station up to this time, but 250 head of yearling sheep and 50 lambs were fed during the winter, also 12 head of steers. Alfalfa was the roughage used in every case, but the sheep were divided into six lots. One lot each was fed alfalfa alone, alfalfa and grain, alfalfa and roots, alfalfa and screenings; two lots were fed alfalfa, grain and roots.

MEETINGS AND CONVENTIONS ATTENDED.

During the past year the Superintendent spoke at a number of Farmers' Institute meetings. He also attended the Western Canada Irrigation Convention, at Kelowna, B.C., in August, the International Irrigation Congress at Salt Lake, Utah, in October, the International Dry-Farming Congress at Lethbridge, where he acted as Chairman of the Jury of Awards. At the Provincial Seed Fair at Claresholm, in February, he gave an address.

EXCURSIONS TO THE FARM, AND VISITORS.

On the 22nd of July, a special train, under the auspices of the Provincial Government, was run from Medicine Hat to the Station, and on the 23rd another train was run from Calgary. These excursions are well patronized and seem to be appreciated by the farmers. All through the year, farmers from this part of the province came to visit the farm and to consult in regard to different problems that confront them. The number of visitors to the farm during the year that were actually counted was 2,400. No doubt many more than this came, as it was impossible to count them all.

DISTRIBUTION OF SAMPLES.

3-pound bags of potatoes sent out	280
Packets of cuttings (willow and poplar)	60
5-pound bags of winter wheat	17
150-pound bags of inoculated alfalfa soil	72

METEOROLOGICAL REPORT.

Months.	Highest Temperature.		Lowest Temperature.		Total Precipitation.	Bright Sunshine.
1912	Date.	Degrees.	Date.	Degrees.	Inches.	Hours.
April	8	71·0	6	17·4	0·20	209·9
May	15	82·8	1	23 6	0·66	280·4
June	26	94·8	6	28·3	1·73	322·7
July	31	86·6	14	36·0	2·78	250·6
August	23	88·7	30	34·1	1·41	240·1
September	18	76·7	28	23·1	2·61	169·3
October	1	72·2	30	14·2	1·07	172·9
November	24	57·4	11	10·1	0·99	129·3
December	4	50·1	2	— 0·9	0·23	102·3
1913.						
January	28	47·0	20	—30·0	0·80	91·9
February	16	57·8	4	—22 0	0·30	102·1
March	8	59·9	25	—23·0	0·42	157·3
Totals					13·20	2228·8

In the above, ten inches of snow is computed as one inch of precipitation.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

Agassiz, B.C.

Since climatic conditions affect farming operations, there is given below a record of weather data taken at the Agassiz Farm during the year. In two respects the past year was phenomenal, there being a very wet, cloudy summer and a very steady winter, during which there were forty-eight consecutive days with snow on the ground. The month of April was somewhat wet but reasonably warm; May was a fine month, and gave an opportunity to finish seeding and planting operations. The first half of June was excellent weather, but, from that time on, with the exception of a short period in September, the weather was unusually dark and rainy.

The grain harvest suffered most of all the operations of the year. The winter was not as severe as in some previous years, the lowest temperature being four degrees above zero, on the 19th of January; 6 feet, 11·7 inches of snow fell, and most of it remained throughout the winter.

METEOROLOGICAL TABLE.

Month.	Maximum Temperature.		Minimum Temperature.		Mean Temp.	Total Precipitation.		Sunshine.		
1912.	Date.	Deg.	Date.	Deg.	Deg.	Rain.	Snow.	Days.	Hrs.	Min.
April	12	64	3	29	46·13	4·26	....	18	59	48
May	11	92	2 & 6	39	57·78	3·99	....	21	168	48
June	23	89	3	35	60·38	5·95	....	21	186	30
July	18	89	6	43	63·26	5·09	....	21	165	54
August	13	86	28	40	60·99	7·84	....	22	154	54
September	17	81	3	36	56·4	2·5	....	25	164	18
October	12	64	20, 23 & 30	33	47·81	6·99	....	13	65	12
November	1 & 7	55	4	31	42·37	13·82	....	8	27	
December	3, 11 & 12	49	10	25	39·45	10·09	....	9	28	18
1913.										
January	2	47	19	4	28·45	11·83	82·8 ins.	6	25	36
February	22	48	4	20	34·8	5·12	....	19	105	6
March	8	59	19	17	40·105	6·75	·9 in.	17	116	24
Totals	....	....	....	....	....	84·24 in.	83·7 in.	200	1,267	48

All things being considered, the farming operations of the year were most successful. The following crops were grown for the support of the live stock on the Farm:—

Hay	116 tons, 260 lb.
Silage corn	240 " 1,185 "
Silage clover	29 " 1,700 "
Mangels	146 " 1,660 "
Turnips	18 " 1,750 "
Carrots	2 " 1,300 "
Beets	2 " 800 "
Potatoes	22 tons.
Mixed Grains	1,152 bushels
Barley	26 tons.
Peas	24 "
Wheat	19 "

Five more acres of land were brought under cultivation and were seeded down to clover. In addition, four acres of land were slashed and burnt during the summer and winter, as other work would permit, and from this a large quantity of wood was obtained for fuel.

About one hundred rods of fencing were erected, and there is still a considerable amount in the course of construction. The fall being wet and the spring late, the usual amount of fall and early spring cultivating could not be done. During the winter, the teams were kept busy hauling manure from the yards and hauling gravel for the upkeep and improvement of the farm roads and also for some of the building operations. Over two hundred yards of this material were hauled, most of it coming from the river, about one and one-half miles distant.

The horses on the Farm are the same as last year. These are kept for working purposes only, although data are being collected as to their food consumption and the time spent tending them, with a view to obtaining the actual cost of maintaining teams in this district.

It has been a very successful year with cattle on the Farm, and there has been much improvement in the appearance of the herd since the last report. In all, there are forty-eight females and two males, all of the Holstein-Friesian breed (the greater proportion of the females being grades). Of the ones which were received from

Ontario last year, to date, only two have been sold as being unprofitable, and the rest have increased in apparent value at least sixty-five per cent. Three pure-bred cows and one pure-bred bull were purchased during the summer. The herd is just now getting into shape so as to be fit to do experimental work upon, and since January, 1913, a certain amount of work has been carried on with regard to the cost of handling dairy cattle and determining the value of certain foods. Very careful data are also being kept of all operations in connection with the herd, so as to have a valuable foundation for future work.

It is gratifying to be able to report a substantial increase in the number of hogs kept on the Farm, nearly all the increase being Farm-bred. There has been a very great demand during the year for breeding stock, particularly the Yorkshire breed, and the supply has been some seventy per cent short. The demand has come chiefly from the newer districts.

The Agassiz herd is still headed by Summerhill Jerry 21st, and there are on hand eleven brood sows, ranging in age from nine months to four years.

Although this branch has been somewhat handicapped by lack of adequate accommodation, there have been but few losses during the year, and the hog branch has proved one of the most profitable on the Farm. Some experimental work was carried on, and valuable data obtained.

With regard to the sheep, the experience of the past year has proved that they are a valuable adjunct even to a dairy farm, and although some of the oldest ewes were sold, the flock increased considerably during the year. The Horned Dorset breed is kept exclusively, and the demand for this breed has increased three hundred per cent in two years. They seem to be well adapted to the damp climate and the lowlands on which they are kept, and are proving to be prolific breeders and very easy keepers.

The Poultry branch has been enlarged considerably. The breeds kept at present are Barred Plymouth Rocks, Single Comb White Leghorns, and Single Comb Rhode Island Reds. Last year the incubator capacity was not large enough to allow the raising of sufficient stock to permit thorough culling in the fall, and there was not, during the winter, the quantity of poultry that had been expected in the previous spring. During the summer, one new laying-house and a small incubator cellar were built, and, at present there is a large number of eggs set for early chicks. It is hoped this year to increase the flock very materially and to get started early in the fall with some experimental work. Trap nesting was carried on with the Barred Rocks and Leghorns, with fairly gratifying results.

With regard to bees, the past season has been more successful than the previous one, and a considerable amount of information has been gathered regarding their care and management under conditions such as obtain in the lower Fraser valley. Commencing the year, there were eleven colonies, but one died early in the season, as they were all quite low in stores. During the summer, swarming was prevented as much as possible, and but two were hived. One of these produced honey freely. In the autumn, there were twelve hives and all had from twenty-five to forty-five pounds of stores, and there was some three hundred pounds of honey to sell. During the winter, two hives were lost probably from too much moisture, there being a backward tilt to the hives. At present, there are remaining ten hives. These are in excellent condition, there being plenty of stores and the queens laying, although spring conditions have not been good. They were wintered outdoors, being covered only with some roofing felt to protect them from high winds and rain. The fronts to the south were left open. All work in connection with the bees, with the exception of extracting some honey, was done by the Superintendent, at odd times. The twelve hives took about eight hours work for the twelve months.

As there is not yet a permanent location whereon to run the field and crop experiments, these have been carried on in the same fields with the regular rotation. This year there were grown:—

Nine varieties of mangels.	Fourteen varieties of oats.
Six varieties of sugar beets.	Twelve varieties of wheat.
Five varieties of field carrots.	Thirteen varieties of peas.
Ten varieties of turnips.	Fifteen varieties of barley.
Eight varieties of silage corn.	Thirty-one varieties of potatoes.

A few fertilizer experiments were also carried on with the root crops, but this was only by way of an introduction to future work in this respect, which it is planned to continue this coming year.

The garden this year was reasonably successful, considering the amount of labour expended upon it, the chief work being variety testing of many kinds of vegetables, annual flowers and bulbs. The greatest drawback to vegetable growing was a bad attack of Root Maggot; this attacked all members of the Brassica or turnip family. The perennial flowers were laid out in a long border under the direction of the Dominion Horticulturist, and a border nine hundred feet long and twelve feet wide was prepared and planted. With this it is hoped to make a reasonable showing this coming season. There is a small home orchard cultivated and ready to plant with a considerable number of varieties of apples, pears, plums, cherries and small fruits. On the lawns and shrubbery, there has been considerable time and labour spent, greatly to the improvement of the place, but there is still much to do. The moles are the greatest drawback to the lawns at Agassiz. Several methods of combatting these were tried this year, but to date, no treatment can be recommended. Experiments, however, are being continued, and there is being tried a new style of trap, so we hope to report progress in this line soon.

Some nine hundred applications for free samples of potatoes were received at Agassiz this year, but, owing to lack of stock, not more than two hundred and forty-three could be filled, results of which are tabulated below:—

REPORTED ON.

Variety.	No. Sent Out.	Reports Received.	Percentage.	Diseased.	Clean.	General Opinion of Variety.
Early Rose	43	23	53	5	18	Fair.
Early Potentate	15	10	67	2	8	Good.
Money Maker	13	3	23	....	3	Poor.
Early Envoy	20	14	70	1	13	Fair.
Late Puritan	2	1	50	1	....	Poor.
Irish Cobbler	14	5	36	1	4	Good.
American Wonder	13	10	77	2	8	"
Dalmeny Beauty	18	9	50	1	8	Fair.
Rochester Rose	6	3	50	2	1	"
Seedling No. 2	38	17	44	5	12	"
Empire State	12	7	58	3	4	"
Morgan Seedling	20	12	60	2	10	"
Hard to Beat	6	1	17	....	1	Poor.
Everett	11	4	36	....	4	Fair.
Factor	3	1	33	1	....	"
Dooley	9	4	44	2	2	"
	243	124	51%	28	96	

During the year the water system has been completed, and this has given excellent satisfaction. Although the main is small, when worked within its capacity it gives one hundred pounds of pressure. All the Farm buildings were painted, and the Superintendent's house and Foreman's cottage were repaired; an ice-house was also built. Late in the fall, the erection of a boarding-house was begun; this, at the time of writing, is not completed, but, when finished, it will be one of the Farm's most valuable assets. It will hold from ten to twenty men, and is being well equipped.

Chief among the implements purchased this year is a corn-planter and also a corn-binder, both of which gave excellent satisfaction; the planter, in particular, paying more than one-half the purchase price in saved labour this season.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
EXPERIMENTAL FARMS

REPORT

FROM THE

DIVISION OF FIELD HUSBANDRY

For the Year ending March 31, 1913

PREPARED BY

Assistant Dominion Field Husbandman, Central Farm, Ottawa	O. C. White, B.S.A.
Superintendent Experimental Station, Charlottetown, P.E.I.	J. A. Clark, B.S.A.
Superintendent Experimental Farm, Nappan, N.S.	R. Robertson.
Superintendent Experimental Station, Cap Rouge, Que.	G. A. Langelier.
Superintendent Experimental Farm, Brandon, Man.	W. C. McKillican, B.S.A.
Superintendent Experimental Farm, Indian Head, Sask.	Angus Mackay.
Superintendent Experimental Station, Rosthern, Sask.	Wm. A. Munro, B.A., B.S.A.
Superintendent Experimental Station, Scott, Sask.	R. E. Everest, B.S.A.
Superintendent Experimental Station, Lacombe, Alta.	G. H. Hutton, B.S.A.
Superintendent Experimental Station, Lethbridge, Alta.	W. H. Fairfield, M.S.

REPORT

FROM THE

DIVISION OF FIELD HUSBANDRY.

CENTRAL EXPERIMENTAL FARM, OTTAWA,
March 31, 1913.

J. H. GRISDALE, Esq., B.Agr.,
Director of Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the accompanying account of the work conducted by the Division of Field Husbandry for the year 1912.

In addition to my own report of the work carried on at the Central Farm, there will be found reports from J. A. Clark, Superintendent Experimental Station, Charlottetown, P.E.I.; R. Robertson, Superintendent Experimental Farm, Nappan, N.S.; G. A. Langelier, Superintendent Experimental Station, Cap Rouge, Que.; W. C. McKillican, Superintendent Experimental Farm, Brandon, Man.; Angus Mackay, Superintendent Experimental Farm, Indian Head, Sask.; Wm. A. Munro, Superintendent Experimental Station, Rosthern, Sask.; R. E. Everest, Superintendent Experimental Station, Scott, Sask.; W. H. Fairfield, Superintendent Experimental Station, Lethbridge, Alta., and G. H. Hutton, Superintendent Experimental Station, Lacombe, Alta.

The experiments and investigations now under way are being conducted along very practical lines, and, as relating to all Experimental Farms and Stations, briefly include:—

1. Investigation of the relative merits of different crop rotations, including special rotation for 'dry farming' conditions.
2. Studies in the methods of culture of, and curing, field crops. A series of cultural experiments adapted to prairie conditions has now been under way two years on each of the six prairie Farms. These tests involve approximately five hundred plots on each Farm, and include twelve different lines of investigation.
3. Determination of the costs of growing field crops under regular farm conditions.
4. Experiments to show the value of underdrainage and irrigation.
5. Studies of the influence of size and character of cultural implements on cost of crop production.
6. Comparisons (in a limited way) of various grains and forage crops as food producers.

In these reports particular importance is attached to the rotation tests which are being carried on at all Farms and Stations with a view to determining how best to

grow a variety of crops suitable for live stock purposes. A comprehensive set of experiments in soil cultivation, inaugurated in 1911, is reported upon for the first time from some of the prairie Farms. While the data this year do not afford any conclusive evidence, we believe that they will be followed with interest and that they will ultimately supply us with much needed information along the lines taken up.

I have the honour to be, sir,
Your obedient servant,

O. C. WHITE,
Assistant Dominion Field Husbandman.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

REPORT OF THE ASSISTANT DOMINION FIELD HUSBANDMAN— O. C. WHITE, B.S.A.

WEATHER CONDITIONS AND CROP NOTES, 1912.

The crop year of 1912 will be remembered as one of the rainiest on record. The month of April was slightly cooler than the average, but cultivation was, nevertheless, commenced in fairly good season, the first grain being sown on April 26. On April 30 the last spring frost was registered. May was exceedingly wet, with the result that seeding operations generally were greatly prolonged, and the seed bed in many cases could not be well prepared. June was just moderate in temperature, with no very hot days, and usually quite cool nights. The early part of the month was showery, the latter part quite dry. The only really hot weather during the whole growing season was between July 3 and July 10. In August the weather turned cool again, and rains were so frequent that harvesting was much delayed, and the quality of the seed in general was poor. Here, where the land is well underdrained, corn made a very good growth, but throughout the district many failures were reported. September continued cool and showery, but no frosts occurred until the 30th. October was cool but fine, and roots were harvested in good condition. Winter set in on November 25.

SOME Weather Observations taken at Central Experimental Farm, Ottawa, 1912.

Month.	Temperature F.			Precipitation.				Total sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	36·4	—26·2	2·24	0·11	25·00	2·61	0·95	119·1
February	35·4	—24·0	12·04	0·07	29·75	3·04	1·30	141·2
March	44·0	—17·0	19·34	0·02	14·00	1·42	0·75	211·0
April	67·0	7·0	39·07	2·60	2·00	2·80	0·68	234·0
May	82·0	33·0	56·25	5·15	....	5·15	1·44	204·3
June	88·4	39·4	61·62	1·35	....	1·35	0·42	308·6
July	95·8	45·6	69·03	3·89	....	3·89	0·83	312·5
August	81·5	40·4	62·54	4·94	....	4·94	1·18	178·8
September	80·0	28·5	58·01	4·01	....	4·01	0·62	102·1
October	75·0	26·2	48·92	2·47	....	2·47	0·66	173·0
November	58·4	5·2	34·42	2·59	23·00	4·89	2·10	83·8
December	50·0	— 4·8	22·65	1·17	10·00	2·17	0·81	66·2
Total	....	....	....	28·37	103·75	38·74	....	2134·6

CROP RETURNS—'200-ACRE FARM.'

Based on the valuations used in the rotation experiments (see page 117), there are given below the costs of producing the various crops grown on the '200-acre Farm' (so called), and the profits therefrom, during the past year.

STATEMENT of Crop Returns on '200-acre Farm', 1912.

Crop.	Area.	Total Cost.	Average cost per acre.	Average cost per bushel or per ton.	Total Yield.	Average yield per acre.	Total Value.	Average value per acre.	Average profit per acre.	Total profit
	Acres.	$ cts.	$ cts.	$ cts.	Lb.		$ cts.	$ cts.	$ cts.	$ cts.
Oats (including cost of straw)...	56.22	862 74	15 35	0 25	115,415	60.38 Bu.	1,154 15	20 53	5 18	291 41
Oat straw.....	....	....	....	....	147,710	1.31 Tons.	295 42	5 25	....	295 42
Corn..	48.50	1,183 82	24 40	1 51	1,565,820	16.14 T.	1,565 82	32 28	7 88	382 00
Roots (mangels and turnips).....	14.78	516 23	34 93	1 50	687,520	23·26 T.	687 52	46 52	11 59	171 29
Potatoes.................	4.00	251 10	62 77	0 14	106,860	445 Bu.	890 50	222 62	159 85	639 40
Green feed (peas and oats)......	3.60	65 09	18 08	1 80	72,330	10.05 T.	72 33	20 09	2 01	7 24
Hay..............	57.22	955 98	16 71	5 52	347,585	3.04 T.	1,216 54	21 26	4 55	260 56
Pig pasture...................	3.15	39 34	12 49	....	....	....	47 26	15 00	2 51	7 91
Total...............	187.47	3,874 30	20 66	....	....	....	5,929 53	31 63	10 97	2,055 23

NOTE—A few acres used for cattle pasture and for cutting green and feeding in field where it could not easily be weighed, were calculated on the basis of the average yield of hay for the remainder of the farm.

Owing to the fact that the charges for both horse and manual labour are higher than in previous years, with no corresponding increase in the valuation of the products, the net profits, as given above, are not so great as last year. A comparison of the value of the returns for the past fourteen years shows, however, very appreciable increases up to the present, and indicates that our system of cultivation and cropping is gradually but surely building up the fertility of our soil. Using the same prices throughout, the value of the products of the '200-acre Farm,' per acre, were: $14.39 in 1899, $21.30 in 1900, $22.98 in 1901, $24.18 in 1902, $21.61 in 1903, $24.50 in 1904, $29.30 in 1905, $23.23 in 1906, $24.45 in 1907, $23.87 in 1908, $28.51 in 1909, $29.58 in 1910, $27.38 in 1911 and $31.63 in 1912.

ROTATION OF CROPS.

The most important work at present in progress at the Central Experimental Farm, is the testing of rotations considered suitable for live stock farming.

It will perhaps not be out of place to repeat what has been said in previous reports in connection with this experiment.

> 'The true farmer will ever have two objects in view when managing his farm: To so manage as to increase gradually but surely the margin of profit, and, at the same time, to render his farm more productive. Many factors must necessarily unite to produce such desirable results, but of one feature we may be certain, there will be followed on such a farmer's farm a regular rotation of crops, for no other single practice in farm management can compare with this in importance. The rotation or rotations adopted, will, of course, depend upon the line of farming followed, and to some extent upon the character of the soil and the physical peculiarities of the farm as a unit, but a rotation there will be.
>
> 'Crop rotation means a certain succession of crops which regularly repeats itself each time the course is run. It really means, further, that the crops follow each other in such order as to insure each having supplies of plant food of such a character as to aid in securing good returns from each particular crop.
>
> 'Hence, in arranging a rotation, it is very necessary to have some knowledge of the food requirements of different crops and to know something of the values of the residues from the different crops included. Certain forage crops, such as corn, roots, potatoes and hay, require an immense amount of food for stem, leaf and root production—that is an abundance of nitrates as is found in clover or other sod turned down, and in well-manured lands. Other crops, such as cereals, can get along best with a lighter supply of nitrates, but need more phosphates, hence do well after some forage crop has taken up the superabundance of free nitrates found after sod. It is evident, therefore, that a good rotation will include (1) meadow or pasture, (2) roots or corn, and (3) some cereal crop.
>
> 'Various combinations of these three classes are possible, and the natural aim of experimental work will be to determine (1) the comparative values of rotations as soil improvers, and (2) their relative suitability for different lines of farming.'

During the year a re-arrangement of the rotations in this experiment was made. Owing to their changed location and to the fact that it was not possible to have the regular crops grown in all cases, the results are not altogether comparable, and will not be included in averages that will be compiled in later years.

The test now includes five rotations, A, B, C, D and R, most of which may be found in more or less common use in the better farming districts of Eastern Canada where live stock is kept.

They are permanently located, it is hoped, and are being studied, keeping in mind the following points of merit:—

1. Their ability to supply different crops in the proper proportions for certain needs.

2. Their power to keep weeds in check.

3. Their comparative profits.

4. Their effect on the fertility of the soil as indicated by an increase or decrease of crop returns from one period of years to another.

Rotation 'A.'

First year.—Corn. Manure applied in spring at rate of 15 tons per acre. Shallow ploughed shortly before corn planting time, turning under both clover and manure. After corn is harvested land is shallow ploughed or cultivated.

Second year.—Grain. Seeded down with 8 pounds red clover, 2 pounds alsike and 10 pounds timothy per acre.

Third year.—Clover hay. Two crops expected. Top dressed in fall with manure at rate of 15 tons per acre.

Fourth year.—Timothy hay. Field ploughed in August, top worked and ribbed up in October.

Fifth year.—Grain. Seeded down with 10 pounds red clover, which is allowed to grow to be turned under following spring for corn.

Rotation 'B.'

First year.—Corn. Manure applied in spring at rate of 15 tons per acre. Shallow ploughed shortly before corn planting time, turning under both clover and manure.

Second year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 5 pounds timothy per acre.

Third year.—Hay. Ploughed late fall, manured at rate of 15 tons per acre.

Fourth year.—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike and 5 pounds timothy per acre.

Fifth year.—Clover hay.

Rotation 'C.'

First year.—Corn.

Second year.—Grain. Seeded down with 10 pounds red clover and 12 pounds timothy per acre.

Third year.—Clover hay.

Fourth year.—Timothy hay. Field ploughed in August, manured at the rate of 24 tons per acre, worked at intervals and ridged up in late fall in preparation for corn.

Rotation 'D.'

First year.—Corn. Manure applied in spring at rate of 18 tons per acre. Shallow ploughed shortly before corn planting time, turning under both clover and manure.

Second year..—Grain. Seeded down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay.

Rotation 'R.'

First year.—Corn. Manure applied in spring at rate of 18 tons per acre. Shallow ploughed shortly before corn planting time, turning under both clover and manure.

Second year.—Peas and oats mixed. Cut green for catttle. Seeded down with 10 pounds red clover, 2 pounds alsike, 6 pounds alfalfa and 6 pounds timothy per acre.

Third year.—Clover hay. Cut green for cattle.

To make comparisons of the returns and net profits in these experiments the following arbitrary values have been used:—

Return Values.

Oats	per bushel	$ 0 31
Oat straw	per ton	4 00
Hay	"	7 00
Corn ensilage	"	2 00
Turnips and mangels	"	2 00
Potatoes	per bushel	0 50
Forage crops (green)	per ton	2 00
Swine pasture	per acre	15 00

Cost Values.

Manual labour	per hour	$0 17
Horse labour, including teamster—		
Single horse	"	0 27
2-horse team	"	0 34
3-horse team	"	0 41
4-horse team	"	0 48
Rent	per acre	3 00
Barnyard manure (spread over rotation)	per ton	1 00
Machinery (inclusive of threshing machinery)	per acre	0 60
Seed oats	"	1 00

Turnip, mangel, potato and corn seed charged at actual cost.
Grass and clover seed charged at actual cost, distributed over the number of years in hay and pasture.
Twine charged at actual cost.
Threshing charged according to actual labour expended.

ROTATION

Rotation Year.	Location.	Description of Soil. Surface soil.	Subsoil.	Area in acres.	Crops. 1911.	1912.	Items of Expense. Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Cost.
				Ac.	1911.	1912.	$ c.	$ c.	No.	$ c.
A 2	F.S. 18.	Gravelly clay loam.	Clay hardpan.	1	Corn........	Oats........	9 52	1 97	5	85
A 1	F.S. 17.	"	"	1	Oats........	Corn........	9 52	1 88	30	5 10
A 5	F.S. 16		"	1	Hay.......	Oats.......	9 52	1 97	5	85
4	F.S. 15.	"	"	1	Hay -.......	Timothy hay	9 52	2 87	8	1 36
A 3	F.S. 14.	"	"	1	Oats... . .	Clover hay..	9 52	2 87	14	2 38
	Aggregate.........			5			47 60	11 56	62	10 54
	Average per acre in 1912........						......	....	....	

ROTATION

Rotation Year.	Location.	Surface soil.	Subsoil.	Area in acres.	1911.	1912.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost.
B 2	F.S. 13.	Clay loam.	Clay hardpan.	1	Corn.. . . .	Oats..... ..	9 00	1 97	4	68
B 1	F.S. 12.	"	"	1	Hay........	Corn	9 00	1 88	30	5 10
B 5	F.S. 11	"	"	1	Oats.......	Clover hay..	9 00	4 69	10	1 70
B 4	F.S. 10.	"	"	1	Hay......	Oats........	9 00	1 97	4	68
B 3	F.S. 9.	"	"	1	Oats........	Clover hay..	9 00	4 69	10	1 70
	Aggregate.......			5			45 00	15 20	58	9 86
	Average per acre in 1912						. ...	....	....	....

ROTATION

Rotation Year.	Location.	Surface soil.	Subsoil.	Area in acres.	1911.	1912.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost.
C 2	F.S. 8.	Clay loam.	Clay hardpan.	1	Corn........	Oats.......	9 00	1 97	5	85
C 1	F.S. 7.	"	"	1	Hay........	Corn........	9 00	1 77	30	5 10
C 4	F.S. 6.	"	"	1	Hay........	Hay...	9 00	3 07	10	1 70
C 3	F.S. 5.	"	"	1	Oats........	Hay.......	9 00	3 07	10	1 70
	Aggregate			4			36 00	9 88	55	9 35
	Average per acre in 1912........						.....	....	....	.. .. . .

* Indicates loss.

"A"

IN RAISING CROP. | PARTICULARS OF CROP.

Horse labour (including teamster.) Hours. Single horse.	2-horse team	3-horse team	4-horse team	Cost of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bus. or 1 ton.	Weight in pounds. Grain.	Straw.	Hay.	Roots, ensilage or green feed.	Total value.	Value of crop per acre.	Profit per acre.
No.	No.	No.	No.	$ c.	$ c.	$ c.	$ c.	$ c.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
.....	2	5¼	2	3 79	1 11	17 24	17 24	45	1,305	2,605	.....	.....	18 26	18 26	1 02
2	11	6	3	8 18	....	24 68	24 68	1 48	.....	......	...	33,370	33 37	33 37	8 69
.....	2	5¼	2	3 79	1 60	17 73	17 73	32	1,885	3,065	......	......	24 98	24 98	7 25
1	4½	....	.....	1 80	......	15 55	15 55	5 04	......	......	6.175	...	21 61	21 61	6 06
1	7½	...	....	2 82	.....	17 59	17 59	3 54	......	..	9,950	..	34 82	34 82	17 23
4	27	16½	7	20 38	2 71	92 79	92 79	......	3,190	5,670	16,125	33,370	133 04	133 01	40 25
...	.....	.....	.....	...	.....	18 56	18 56	..	...	......	......	......	26 61	26 61	8 05
"B"															
....	2	5¼	2	3 79	1 29	16 73	16 73	37	1,526	2,379	......	......	20 02	20 02	3 29
2	11	6	3	8 18	......	24 16	24 16	1 32	......	......	......	36,730	36 73	36 73	12 57
1	6½	....	.....	2 48	....	17 87	17 87	4 46	...	......	9,020	..	31 57	31 57	13 70
....	2	5¼	2	3 79	1 10	16 54	16 54	43	1,299	2,501	......	..	17 99	17 99	1 45
1	6½	....	....	2 48	.....	17 87	17 87	3 92	....	....	9,120	......	31 92	31 92	14 05
4	28	16½	7	20 72	2 39	93 17	93 17	..	2,825	4,880	18,140	36,730	138 23	138 23	45 06
.....	.....	.....	....	..	......	18 63	18 63	....	.....	....	......	.	27 64	27 64	9 01
"C"															
....	2	5¼	2	3 79	1 08	16 69	16 69	45	1,275	1,705	.....	......	16 16	16 16	53*
2	11	6	3	8 18	..	24 05	24 05	2 10	.....	.....	.....	22,900	22 90	22 90	1 15*
1	7	.....	....	2 65	..	16 42	16 42	3 80	......	......	8,650	......	30 27	30 27	13 85
1	7	.....	.....	2 65	...	16 42	16 42	3 81	......	......	8,610	......	30 13	30 13	13 71
4	27	11¼	5	17 27	1 08	73 58	73 58	.....	1,275	1,705	17,260	22,900	99 46	99 46	25 88
.....	.....	.....	.....	.....	.....	18 39	18 39	......	.....	.....	...	..	24 86	24 86	6 47

ROTATION

Rotation Year.	Location.	Description of Soil.		Area in acres.	Crops.		Items of Expense			
		Surface soil.	Subsoil.				Rent and manure.	Seed, twine and use of machinery.	Manual Labour.	
									Hours.	Cost.
				Ac.	1911.	1912.	$ c.	$ c.	No.	$ c.
D 1.	F.S. 4.	Loam	Clay hard pan.	1	Corn........	Oats........	9 00	1 97	4	0 68
D 2.	F.S. 3. .	"	" ...	1	Hay..	Corn........	9 00	1 87	30	5 10
D 3.	F.S. 2. .	"	" ...	1	Oats..	Hay..	9 00	6 09	10	1 70
Aggregate.......................				3	. ...	....	27 00	9 93	44	7 48
Average per acre in 1912...				..	....	....	......	......	......	....

ROTATION

Rotation Year.	Location.	Surface soil.	Subsoil.	Area in acres.	1911.	1912.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost.
R 1.	EPG S 1	Sandy loam.	Hardpan. . .	1·6	Peas & oats.	Hay..	14 40	9 74	6	1 02
R 2.	EPG S 2	" ..	" ..	1·6	Corn........	Peas & oats.	14 40	3 36	20	3 40
R 3.	EPG S 3	" ..	" ..	1·6	Hay..	Turnips	.....	....	....	. ....
Aggregate				4·8	....	.. ..	......	....	....	... .
Average per acre in 1912				..	....	....	......	. ...	....	....

"D."

in raising Crop.									Particulars of Crop.						
Horse labour (including teamster.)					Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bus. or 1 ton.	Weight in Pounds.				Total value.	Value of crop per acre.	Profit per acre.
Hours.				Cost of horse labour.					Grain.	Straw.	Hay	Roots, ensilage or green feed.			
Single horse.	2-horse team	3-horse team	4-horse team												
No.	No.	No.	No.	$ c.	$ c.	$ c.	$ c.	$ c.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
.....	2	5¼	2	3 79	1 25	16 69	16 69	0 38	1,482	1,768	.....	....	18 36	18 36	1 67
2	11	6	3	8 18	......	24 15	24 15	1 70	......	....	......	28,420	28 42	28 42	4 27
1	7	.....	.....	2 65	.....	19 44	19 44	5 14	.....	......	7,570	......	26 50	26 50	7 06
3	20	11¼	5	14 62	1 25	60 28	60 28	......	1,482	1,768	7,570	28,420	73 28	73 28	13 00
....	...	.....	.....	......	......	20 09	20 09	......	.....	......	.....	......	24 42	24 42	4 33

"R."

½	4¼	. ..	.....	1 58	......	26 74	16 71	.....	.....	...	8,000	......	28 00	17 50	0 79
1½	11	8	2	8 38	......	29 54	18 46	......	.....	.....	......	32,000	32 00	20 00	1 54
....	.....	....	....	.....	...	50 56	31 60	......	......	......	......	52,260	52 26	32 66	1 06
.....	..	.....	.....	... .	.....	106 84	66 77	....	.....	......	8,000	84,260	112 26	70 16	3 39
.....	.....	.....	.....	.....	....	22 25	22 25	......	.....	......	......	......	23 38	23 38	1 13

The following table presents in brief, the comparative costs, returns and net profits of the above rotations for 1912:—

Rotation Experiment.—Comparative Costs, Returns and Net Profits, 1912.

Rotation.	Total cost to operate.	Value of returns.	Net profit.
	$ cts.	$ cts.	$ cts.
'A' five years' duration	18 56	26 61	8 05
'B' five years' duration	18 63	27 64	9 01
'C' four years' duration	18 39	24 86	6 47
'D' three years' duration	20 09	24 42	4 33
'R' three years' duration	22 25	23 38	1 13

These figures may not, however, represent the relative value of these rotations under normal conditions, and, for the reasons stated above, they will not be used in future calculations.

In 1911 an eight-years' test with rotations 'A,' 'B,' 'C' and 'D' was completed. Based on this extended test we would submit the following regarding them:—

Rotation 'A.'—This rotation has proven an excellent one. When carefully followed and where cultural operations were well performed weeds have been kept under fair control, and crop yields have been maintained. It supplies a relatively larger proportion of grain to roots and hay than the ordinary three or four-course rotation, and for that reason would be preferable under conditions where considerable grain is called for.

Rotation 'B.'—While this rotation has maintained crop yields, and has given profits equal to rotation 'A' in the test just completed, we do not yet feel that we could recommend it as being equal to rotation 'A' in all respects. In the average season, when two crops of clover would be taken off, no early fall ploughing is possible, and weeds are therefore not so easily combatted.

Rotation 'C.'—This rotation is most satisfactory from all standpoints except that it supplies a rather smaller proportion of grain than is often desired. Where live stock is the mainstay of the farm, this is, however, a very minor fault. The turning of a shallow furrow, when ploughing sod in preparation for grain or corn, has been found to be good practice here. In preparing for roots, deeper ploughing or the regular plough with subsoiler is to be advised.

Rotation 'D.'—This would be a most excellent rotation to put into practice where sufficient rough land was available to serve as pasturage. It is the rotation that would supply the greatest amount of forage of the best description for dairying or beef production. It is better suited for heavy than for light soils.

If a careful examination of the above rotations be made there will be noted a few desirable characteristics common to all:—

1. Grain fields are always seeded down with clover, even though it be used only as a fertilizer, as in the case of the fifth year of rotation ' '

2. Grass and clover seedings are heavy. Increased crops of hay and rare failures of a catch have justified them.

3. Hoed crops form a large proportion of every rotation. An attempt to farm a small area without a hoed crop was not successful. Weeds could not readily be kept in check.

4. No field is left in hay for more than two successive years. Our records show that the second crop almost always costs more per ton than the first, and that succeeding crops are very liable to be grown at a loss.

'SHALLOW PLOUGHING AND DEEP CULTIVATION' *VERSUS* 'DEEP PLOUGHING.'

The season of 1911 completed an eight-years' test of the above methods of preparing land for hoed crops. While the results have shown the advantage of deep over shallow tillage, especially in preparing for roots, they have not indicated to any marked degree, a superiority of one or the other of the above methods.

In 1912 the two four-year rotations used in this experiment were re-arranged, and divided into eight one-acre plots. The experiment will be continued for another term of years, but, owing to the changes made, this year's results will not be included in averages that will be drawn.

Rotation 'S' (Shallow ploughing and deep cultivation).

First year.—Corn or roots. Field manured at rate of 24 tons per acre. Ploughed out of sod previous August, 4 inches deep, and subsoiled to a depth of 8 to 9 inches, worked at intervals and ridged up in fall. In case manure is not applied before ploughing, deep cultivation is attained by means of a strong, deep-reaching cultivator, after the sod has rotted in the fall, or the next spring. After the corn crop is harvested the land is ploughed shallow or cultivated in preparation for the grain which follows.

Second year.—Grain. Seeded down with 10 pounds red clover and 12 pounds timothy per acre.

Third year.—Clover hay. Cut twice in the season, and the aftermath left on the field.

Fourth year.—Timothy hay. Broken in August and prepared for corn or roots, as indicated above.

Rotation 'P' (Deep ploughing).

This rotation differs from rotation 'S' only in the treatment of the timothy hay field in preparation for corn or roots. It is manured and ploughed in August, 7 inches deep, top worked, and ploughed again in late fall, 7 inches deep.

The details of cost and returns are shown in the tables herewith presented.

ROTATION

Rotation Year.	Location.	Description of Soil. Surface soil.	Description of Soil. Subsoil.	Area in acres.	Crops. 1911.	Crops. 1912.	Items of Expense. Rent and manure. $ c.	Seed, twine and use of machinery. $ c.	Manual Labor. Hours. No.	Manual Labor. Cost. $ c.
S 1.	E.P.G S.4	Sandy loam.	Gravelly clay..	1	Corn......	Oats......	9 00	1 94	5	0 85
S 2.	E.P.G.S.5	" .	" .	1	Oats........	Peas & oats.	9 00	2 10	12	2 04
S 3.	E.P.G.S.8	" .	" ..	1	Hay........	Hay........	9 00	2 77	9	1 53
S 4.	E.P.G.S.9	" .	" ..	1	Hay........	Corn........	9 00	1 87	26	4 42
Aggregate........................				4			36 00	8 68	....	8 84
Average per acre..................							......	....	....	....

ROTATION

Rotation Year.	Location.	Surface soil.	Subsoil.	Area in acres.	1911.	1912.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost.
P 1	E.P.G.S.6	Sandy loam.	Gravelly clay..	1	Corn......	Oats........	9 00	1 97	5	0 85
P 2	E.P.G.S.7	" .	" ..	1	Oats........	Peas & oats.	9 00	2 10	12	2 04
P 3	EPGS. 10	" .	" ..	1	Hay	Hay.......	9 00	2 77	9	1 53
P 4	EPGS. 11	" .	" ..	1	Hay..	Corn......	9 00	1 87	26	4 42
Aggregate........................				4			36 00	8 71	....	8 84
Average per acre in 1912							......	......	....	....

,'S" (Shallow ploughing and deep cultivation).

in raising Crop.									Particulars of Crop.						
Horse labor (including teamster).									Weight in Pounds.						
Hours.															
Single horse.	2-horse team	3-horse team	4-horse team	Cost of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bus. or 1 ton.	Grain.	Straw.	Hay.	Roots, ensilage or green feed.	Total value.	Value of crop per acre.	Profit per acre.
No.	No.	No.	No.	$ c.	$ c.	$ c.	$ c.	$ c.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
½	2	6¼	1	3 85	2 09	17 73	17 73	0 24	2,459	3,321	......	......	31 23	31 23	13 50
1	6⅓	5½	1	5 21	.....	18 35	18 35	1 95	...	....	..	18,860	18 86	18 86	0 51
1	5½	.....	.....	2 14	......	15 44	15 44	4 77	......	......	6,470	...	22 64	22 64	7 20
2	27	3	¼	11 07	...	26 36	26 36	1 47	....	....	.....	35,840	35 84	35 84	9 48
....	.....	.....	.....	22 27	2 09	77 88	77 88	.....	2,459	3,321	6,470	54,700	108 57	108 57	30 69
.....	.....	.....	.....	....	....	19 47	19 47	....	....	......	.....	....	27 14	27 14	7 67

'P" (Deep ploughing).

Single horse.	2-horse team	3-horse team	4-horse team	Cost of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bus. or 1 ton.	Grain.	Straw.	Hay.	Roots, ensilage or green feed.	Total value.	Value of crop per acre.	Profit per acre.
½	2	6¼	1	3 85	2 36	18 03	18 03	0 22	2,774	3,226	....	..	34 19	34 19	16 16
1	6½	5½	1	5 21	......	18 35	18 35	1 71	....	.....	......	21,470	21 47	21 47	3 12
1	5½	.....	.. ..	2 14	....	15 44	15 44	4 86	..	....	6,160	.	21 56	21 56	6 12
2	11	10	1¼	8 98	....	24 27	24 27	1 25	......	.....	....	38,750	38 75	38 75	14 48
..	.....	.....	.....	20 18	2 36	76 09	76 09	......	2,774	3,226	6,160	60,220	115 97	115 97	39 88
....	.....	.....	.....	.....	19 02	19 02	....	....	.....	.....	......	......	28 99	28 99	9 97

COMPARATIVE Costs, Returns, and Profits, 1912, 'Shallow Ploughing and Deep Cultivation' *versus* 'Deep Ploughing.'

Rotation.	Total cost to operate.	Total value of returns.	Net profit.
	$ cts.	$ cts.	$ cts.
'S' (shallow ploughing and deep cultivation)	19 47	27 14	7 67
'P' (deep ploughing)	19 02	28 99	9 97

COMMERCIAL FERTILIZER EXPERIMENT.

In 1909 three rotations, having for object the gaining of information as to the value of commercial fertilizers in regular farm rotation, were introduced. In this experiment, superphosphate, muriate of potash and nitrate of soda are being substituted to a greater or lesser extent for barnyard manure. In 1912 a further rotation was added in which no fertilizer of any kind is used. The nomenclature has been changed, so that rotations 'A,' 'B,' 'C' Fertilizer are now 'X,' 'Y' and 'Z,' respectively, and the added rotation is termed 'N.'

Rotation 'N'.

This rotation is of four years' duration, and includes, grain, hay, pasture, roots. The grain follows roots, the land being ploughed shallow or cultivated after the hoed crop is harvested. With the grain is sown 8 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre. Field is left seeded down two years, first year of which is cut for hay, second is pastured. In August, pasture land is ploughed 5 inches deep, worked at intervals during the autumn and ribbed up in the late fall. The following spring the land is worked into good tilth and sown to roots, no manure or commercial fertilizer of any kind being applied.

Rotation 'X'.

This rotation is of four years' duration, and includes grain, hay two years, roots. The grain follows roots, the land being ploughed or cultivated in the fall after the hoed crop is harvested. With the grain is sown 8 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre. The clover hay is cut twice in the season. After the second year hay the land is manured at the rate of 15 tons barnyard manure per acre, and ploughed in August, 5 inches deep, worked at intervals during the autumn and ribbed up in the late fall. The following spring the land is worked into good tilth and sown to roots.

Rotation 'Y'.

This rotation is of four years' duration, and includes grain, hay two years, and roots. The grain follows roots, the land being ploughed or cultivated in the fall after the hoed crop is harvested. With the grain is sown 8 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre. The clover hay is cut twice in the season. After the second year hay, the land is ploughed in August, 5 inches deep, worked at inter-

vals during the autumn and ribbed up in the late fall. The following spring the land is worked into good tilth and 300 pounds superphosphate, 75 pounds muriate of potash and 100 pounds nitrate of soda are applied before being sown to roots. In addition to the above, the land receives a dressing of 100 pounds nitrate of soda per acre each year that the field is in hay or grain. This application is given in early spring on the grass, and just as the grain is coming through, when under grain.

Rotation 'Z.'

This rotation is of four years' duration, and includes grain, hay two years, roots. The grain follows roots, the land being ploughed or cultivated in the fall after the hoed crop is harvested. With the grain is sown 8 pounds red clover, 2 pounds alsike and 12 pounds timothy per acre. The clover hay is cut twice in the season. After the second year hay, the land is manured at the rate of 7½ tons barnyard manure per acre and ploughed in August, 5 inches deep, worked at intervals during the autumn and ribbed up in the late fall. The following spring the land is worked into good tilth and 150 pounds superphosphate, 37½ pounds muriate of potash and 50 pounds nitrate of soda are applied before being sown to roots. In addition to the above the land receives a dressing of 100 pounds nitrate of soda per acre each year that the field is in hay or grain. This application is given in early spring on the grass, and just as the grain is coming through, when under grain.

In the following tables of results, rotation 'N' is not included, as it had not been under proper rotation long enough to be comparable with the others.

FERTILIZER ROTATION

Rotation Year.	Location.	Description of Soil. Surface soil.	Subsoil.	Area in acres.	Crops. 1911.	1912.	Items of Expense. Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Cost.
				Ac.			$ c.	$ c.	No.	$ c.
X 1.	A. S. 5	Clay loam..	Clay hard-pan..	1	Hay..	Mangels....	6 75	2 10	83	14 11
X 2.	A. S. 8	" ..	" ...	1	Mangels....	Oats........	6 75	1 94	5	0 85
X 3.	A. S. 11	Black muck.	" ...	1	Hay..	Timothy hay	6 75	3 07	5	0 85
X 4.	A. S. 14	" ..	" ...	1	Oats.......	Clover hay..	6 75	3 07	10	1 70
	Aggregate......................			4	....	....	27 00	10 18	....	17 51
	Average per acre in 1912.........				....	....	6 75	2 55	....	4 38
	Average per acre for 4 years.....			..	....	....	5 63	1 70	....	5 90

FERTILIZER ROTATION

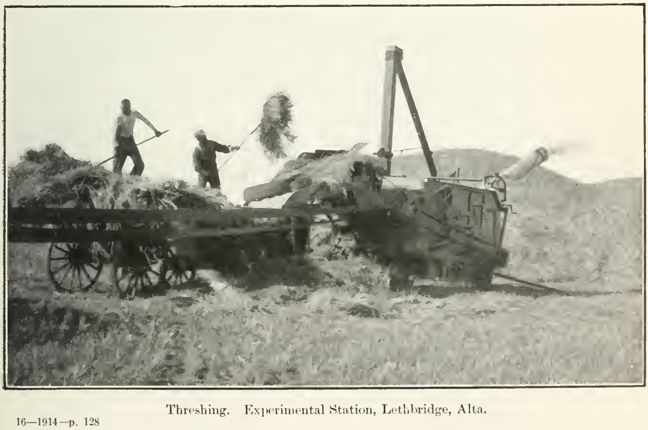
Rotation Year.	Location.	Surface soil.	Subsoil.	Area in acres.	1911.	1912.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost.
Y 1.	A. S. 6	Clay loam ..	Clay hard-pan..	1	Hay....	Mangels....	7 14	2 10	83	14 11
Y 2.	A. S. 9	" ..	" ...	1	Mangels....	Oats........	7 14	1 94	5	0 85
Y 3.	A. S. 12	Black muck.	" ...	1	Hay....	Timothy hay	7 14	3 07	5	0 85
Y 4.	A. S. 15	" ..	" ...	1	Oats........	Clover hay..	7 14	3 07	10	1 70
	Aggregate......................			4	....	....	28 56	10 18	....	17 51
	Average per acre in 1912...........			...	....	....	7 14	2 55	....	4 38
	Average per acre for 4 years.......			...	....	....	7 41	1 68	... ...	6 09

FERTILIZER ROTATION

Rotation Year.	Location.	Surface soil.	Subsoil.	Area in acres.	1911.	1912.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost.
Z 1..	A. S. 7	Clay loam ..	Clay hard-pan.	1	Hay..	Mangels....	8 07	2 10	83	14 11
Z 2..	A. S. 10	" ..	" . .	1	Mangels. .	Oats....	8 07	1 94	5	0 85
Z 3..	A. S. 13	Black muck.	" ...	1	Hay....	Timothy hay	8 07	3 07	5	0 85
Z 4..	A. S. 16	Gravel......	" ...	1	Oats........	Clover hay..	8 07	3 07	10	1 70
	Aggregate........			4	....	....	32 28	10 18	....	17 51
	Average per acre in 1912			...	....	....	8 07	2 55	....	4 38
	Average per acre for 4 years. .. .			..	....	....	6 97	1 68	....	6 02

* Indicates loss.

The Oat Crop, Experimental Station, Lacombe, Alta.



Threshing. Experimental Station, Lethbridge, Alta.

"X." (Barnyard manure.)

IN RAISING CROP.									PARTICULARS OF CROP.						
Horse labour (including teamster).					Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bus. or 1 ton.	Weight in Pounds.				Total value.	Value of crop per acre.	Profit per acre.
Hours.				Cost of horse labour.					Grain.	Straw.	Hay.	Roots, ensilage or green feed.			
Single horse.	2-horse team	3-horse team	4-horse team												
No.	No.	No.	No.	No.	$ c.	$ c.	$ c.	$ c.	Lb.	Lb.	Lb.	Lb.	$ c	$ c.	$ c.
6	15½	6	5	11 75	......	34 71	34 71	1 44	.....	......	......	48,360	48 36	48 36	13 65
....	2	7	.....	3 55	2 12	15 21	15 21	0 21	2,492	3,238	......	.....	31 40	31 40	16 19
1	4½	.....	.....	1 80	....	12 47	12 47	4 53	......	......	5,500	.....	19 25	19 25	6 78
1	8	.....	.....	2 99	......	14 51	14 51	4 46	......	....	6,500	...	22 75	22 75	8 24
....	...	...	.....	20 09	2 12	76 90	76 90	....	2,492	3,238	12,000	48,360	121 76	121 76	44 86
....	....	....	.....	5 02	0 53	19 23	19 23	....	623	809	3,000	12,090	30 44	30 44	11 21
...	.....	.....	....	4 91	0 31	18 45	18 45	......	539	525	2,828	12,568	26 90	26 90	8 45

"Y" (Commercial Fertilizers.)

6	15½	6	5	11 75	..	35 10	35 10	1 43	......	......	.....	49,130	49 13	49 13	14 03
.....	2	7	....	3 55	1 20	14 68	14 68	0 35	1,421	1,909	......	....	18 03	18 03	3 35
1	4½	.....	.....	1 80	....	12 86	12 86	5 29	.....	....	4,860	....	17 01	17 01	4 15
1	8	.....	.....	2 99	......	14 90	14 90	4 41	.....	.....	6,750	.....	23 62	23 62	8 72
.....	.....	.....	.....	20 09	1 20	77 54	77 54	.. ...	1,421	1,909	11,610	49,130	107 79	107 79	30 25
.....	....	.....	.....	5 02	0 30	19 39	19 39	......	355	477	2,902	12,282	26 95	26 95	7 56
.....	....	.....	.....	4 72	0 27	20 17	20 17	....	297	448	2,733	12,782	26 25	26 25	6 08

"Z" (Barnyard manure and Commercial Fertilizers.)

6	15½	6	5	11 75	.....	36 03	36 03	1 49	...	.....	......	48,360	48 36	48 36	12 33
.....	2	7	.....	3 55	0 88	15 29	15 29	0 50	1,035	1,945	......	.. .	14 24	14 24	1 05*
1	4½	... .	.....	1 80	.... .	13 79	13 79	5 45	.....	.....	5,060	......	17 71	17 71	3 92
1	8	.....	....	2 99	......	15 83	15 83	5 22	....	.....	6,060	......	21 21	21 21	5 38
.....	.....	.....	.....	20 09	0 88	80 94	80 94	......	1,035	1,945	11,120	48,360	101 52	101 52	20 58
.....	.....	.....	....	5 02	0 22	20 24	20 24	.....	259	486	2,980	12,090	25 38	25 38	5 14
.....	.....	... .	.....	4 80	0 23	19 70	19 70	......	281	469	2,932	13,322	27 33	27 33	7 63

COMMERCIAL Fertilizer Experiment.—Comparative Costs, Returns and Net Profits, average of 4 years.

Rotation.	Cost to Operate.	Value of Returns.	Net Profit.
	$ cts.	$ cts.	$ cts.
'X' barnyard manure	18 45	26 90	8 45
'Y' commercial fertilizers	20 17	26 25	6 08
'Z' barnyard manure and commercial fertilizers	19 70	27 33	7 63

PROPOSED EXPERIMENTAL WORK.

In addition to the rotation tests and to the costs of production work now under way it is proposed to inaugurate a series of cultural experiments similar in purpose and outline to those conducted on our prairie farms. In the carrying out of such work we are, however, very greatly handicapped because of the limited area of land at our disposal. The growth of the other Divisions and the establishment of new Divisions has necessitated the concession of small areas from time to time to make possible the new work. We have now, in all, less than two hundred acres on which to carry the stock of the Division of Animal Husbandry, and to conduct experiments which cannot always be designed to supply the greatest amounts of the kinds of food required. By the use of soiling crops and other intensive methods we have endeavoured to produce a maximum of feeds. Much further economizing of space through this means is not practicable, however, and I would present for your consideration the need to acquire more land, if the Division is to carry out to best advantage the work for which it was instituted.

EXPERIMENTAL STATION FOR PRINCE EDWARD ISLAND, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT, J. A. CLARK, B.S.A.

WEATHER CONDITIONS AND CROP NOTES, 1912.

A mild spell of weather about the middle of April gave promise of an early spring. Cold, dull weather followed, and it was not until the 11th of May that seeding began at this Station. The greater part of May was so backward that the leaves and the blossoms were fully three weeks later bursting out than in the spring of 1911; a frost that wilted the clovers occurred on the 22nd. June was decidedly cool. The mean temperature was more than a degree below the average. Cutworms did much damage in the province. During the first half of July the heat was extreme, and during the latter half the rainfall was excessive. Large quantities of hay were ruined throughout the province. The cool, late spring and the heavy rains of July and August caused the hay crop to fall below the average, both in quantity and quality. The early grain also suffered much from this, and gave yields much below the same varieties sown later. This was a very unusual occurrence in this province. In many sections haymaking was continued until harvest, or about the third week in August. The oats filled well, but smut was very prevalent. Rust and the joint worm did much injury to the wheat crop. September proved to be a good harvest month. The late grain ripened very slowly, yet where it did mature it was heavy and well filled. No killing frost occurred during the month. The potato crop was good, and when harvested was very free from rot. The corn, mangels and sugar beets were scarcely an average crop, but the turnips and carrots gave heavy yields. A severe frost occurred on the 16th of October, but it was not until the 12th of November that the more hardy vegetation was killed. The weather was open and a very large percentage of the fall work was completed in the early autumn.

Some Weather Observations taken at Charlottetown Experimental Station, 1912.

Month.	Temperature F.			Precipitation,				Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	50·0	— 3·0	24·17	2·01	15·7	3·58	0·67	82·6
February	48·0	—17·5	13·46	0·34	21·8	2·52	1·30	117·6
March	60·0	— 4·0	30·80	3·21	14·0	4·61	0·63	180·6
April	62·0	12·0	35·72	2·37	7·9	3·16	0·88	163·1
May	79·0	27·0	50·53	2·64	....	2·64	0·83	235·0
June	84·5	36·0	57·82	2·49	....	2·49	1·16	251·1
July	91·5	39·0	64·90	6·83	....	6·83	2·18	195·8
August	81·0	45·0	61·68	2·68	....	2·68	0·72	181·9
September	73·0	38·0	54·02	2·90	....	2·90	0·83	167·9
October	73·0	28·5	47·71	3·72	....	3·72	1·58	134·2
November	65·0	25·0	37·01	3·59	6·5	4·24	1·06	51·7
December	50·0	— 2·0	26·60	5·40	10·5	6·45	1·05	68·7
Total	....	....	....	38·18	76·4	45·82	....	1,830·2

ROTATION OF CROPS.

Six rotations varying in duration and treatment were started in 1912, on the land to the west of the farm buildings. The area they cover extends north along the railway to the De Blois road. They are laid out in fields as follows:—

A and B, 1·00 acre each; C, ·57 of an acre; D, 1·00 acre; F, ·88 of an acre; G, ·4 of an acre.

Rotation 'A' (five years' duration).

First year.—Corn. Manured 25 tons per acre.
Second year.—Oats. Seeded down.
Third year.—Clover hay.
Fourth year.—Timothy hay or pasture.
Fifth year.—Oats.

Rotation 'B' (five years' duration).

First year.—Corn.
Second year.—Grain. Seeded down.
Third year.—Clover hay.
Fourth year.—Grain. Seeded down.
Fifth year.—Clover hay.

Rotation 'C' (four years' duration).

First year.—Hoed crop. Manured 20 tons per acre.
Second year.—Grain. Seeded down.
Third year.—Clover hay.
Fourth year.—Timothy hay or pasture.

Rotation 'D' (three years' duration).

First year.—Hoed crop. Manured 15 tons per acre.
Second year.—Grain. Seeded down.
Third year.—Clover hay.

Rotation 'F' (four years' duration).

First year.—Hoed crop. Manured 20 tons per acre.
Second year.—Grain. Seeded down.
Third year.—Clover hay.
Fourth year.—Grain. Seeded down.

Rotation 'G' (seven years' duration).

First year.—Grain.
Second year.—Hoed crop.
Third year.—Wheat or barley. Seeded down.
Fourth year.—Clover hay.
Fifth year.—Timothy hay.
Sixth year.—Pasture.
Seventh year.—Pasture.

The land available for this rotation work was very uneven. On rotation 'A' there had been several buildings, as well as a cellar and an old brick-yard. Two feet of brick clay were removed from part of the land before the normal surface was

reached. Rotations 'B', 'D' and 'F' were partly drained in 1911. Rotation 'C' contains a filled pond, house cellar and door yard. Rotation 'G' also contained a large pond area that was drained and filled. Careful accounts were kept which will prove valuable in time. On these fields the cereals considered most suitable to the province were multiplied, so as to be available to those wishing to purchase pure seed.

MIXED GRAINS.

Experiments are being conducted to determine the best mixture of crops for green feed, and for the production of grain for feeding stock. The results of these will be published when averages for several years have been obtained.

PROPOSED EXPERIMENTAL WORK.

Cultural experiments have been held in abeyance pending the addition of more land to the Station. A great amount of work along these lines has been planned, and will be instituted just as soon as the land can be properly prepared for it.

EXPERIMENTAL FARM FOR NOVA SCOTIA, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT, R. ROBERTSON.

WEATHER CONDITIONS, 1912.

The spring of 1912 opened dull and cold with some frosts during April. On the 10th the thermometer registered 15 degrees of frost and on the 25th 7 degrees. No snow fell during the month, but there was a rather heavy precipitation of rain. During May the weather was cold, and for the first three weeks dry, with just enough rain falling to retard seeding operations, which became general about the 15th. The precipitation during the last week of this month was much heavier than usual. June, although having no great amount of rainfall, was both cool and damp. Grain and roots did fairly well, but corn was almost a complete failure. July was a dry, warm month until the 22nd, after which rain fell continually until the end of the month, giving a total precipitation of 6·62 inches. Hay and grain did well, but roots made poor growth. The latter part of August was practically continuous rainfall. Haymaking was almost impossible, the grain lodged badly, and root crops suffered severely. Due to the heavy rains no cultivating could be done after July 22. September's rainfall of 2·86 inches was below the average, but this, together with the heavy rains of the previous month, made the harvesting operations slow, especially in the case of grain. No frost was recorded up to this time. October was a very fine month with a light precipitation and a few light frosts, a splendid month for harvesting roots and getting the general fall work done. November was also a very seasonable month enabling the fall work to be further advanced than usual.

Some Weather Observations taken at Nappan Experimental Farm, 1912.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	
1912.	°	°	°	Inches.	Inches.	Inches.	Hours.
January	45	−24	11·70	·55	14.00	1·95	148·50
February	45	−18	18·22	·16	16·00	1·76	124·00
March	48	−15	27·54	1 26	11·50	2·41	117·00
April	66	17	37·64	2·04	....	2·04	117 00
May	77	24	50·27	2·74	....	2·74	164·00
June	84	35	56·29	2 32	....	2 32	242 00
July	92	40	63·61	6·62	....	6·62	151·00
August	81	38	60·75	4·82	....	4·82	175·80
September	73	33	52·99	2·86	....	2·86	149·90
October	74	25	46·80	1·67	....	1·67	146 90
November	66	14	36 32	3·70	....	3·70	77·45
December	51	0	26·33	5·62	....	5·62	81·50
	....	....	....	34 36	41·50	38 51	1695·05

CROP YIELDS.

Below is a summary of the yields of the crops grown, exclusive of uniform test plots of grain and potatoes.

Field grain	1,110 bush.	38 lb.
Turnips and mangels	6,315 "	15 "
Fodder corn	25 tons	50 "
Hay	134 "	1,975 "

The field grain consisted of upland and marsh oats, barley and mixed grain (2 bushels of oats, 1 bushel of barley and 1 peck of peas, sown at the rate of three bushels per acre). The yields were as follows:

8 acres	upland oats yielded	55 bush.	6 lb.	per acre.
6 "	marsh oats "	22 "	8	"
$1\frac{3}{4}$ "	barley "	34 "	4	"
$8\frac{1}{2}$ "	mixed grain "	46 "	20	"

TURNIPS.

Six varieties of turnips were grown in fields of one-half acre each. The land was a clay loam in only a fair state of fertility, and was given a dressing of barnyard manure at the rate of 24 tons per acre. Where commercial fertilizer was used in addition to the manure, it was applied at the rate of 300 pounds per acre.

The following were the results:—

VARIETIES of Turnips with Manure alone, and with Commercial Fertilizer in addition to Manure.

Area.	Name of Variety.	Yield per Acre.		Yield per Acre.	
Acres.		Tons.	Lb.	Bush.	Lb
$\frac{1}{2}$	Improved Greystone, manure with fertilizer	31	1,115	1,051	55
$\frac{1}{2}$	" " only	30	1,490	1,024	50
$\frac{1}{2}$	Rennie's Prize, manure with fertilizer	20	1,470	691	10
$\frac{1}{2}$	" " only	20	1,340	689	00
$\frac{1}{2}$	Magnum Bonum, manure with fertilizer	17	580	576	20
$\frac{1}{2}$	" " only	20	560	676	00
$\frac{1}{2}$	Best of All, manure with fertilizer	16	500	541	40
$\frac{1}{2}$	" " only	18	400	606	40
$\frac{1}{2}$	Canadian Gem, manure with fertilizer	18	1,370	622	50
$\frac{1}{2}$	" " only	14	1,900	498	20
$\frac{1}{2}$	Kangaroo, manure with fertilizer	10	1,220	353	40
$\frac{1}{2}$	" " only	7	1,760	262	40

In addition to the above, four acres of turnips were grown in acre plots, on a clay loam on which was spread manure at the rate of 20 tons per acre. On account of the extremely wet weather this crop received very little cultivation. The following are the results:—

1 acre mixed Best of All and Greystone	625 bush.	per acre.
1 " Hartley's Bronze	390	"	"
1 " Elephant	310	"	"
1 " mixed Hartley's Bronze and Sutton's Champion	240	"	"

MANGELS.

Three varieties of mangels were grown in one-third acre plots. The land was a clay loam and was given a dressing of 20 tons of manure per acre.

The following yields were obtained:—

Yields of Field Lots of Mangels, Nappan, 1912.

Area.	Name of Variety.	Yield per Acre.		Yield per Acre.	
Acres.		Tons.	Lb.	Bush.	Lb.
⅓	Mammoth Long Red	11	1,445	390	45
⅓	Yellow Globe	10	475	341	15
⅓	Yellow Intermediate	8	200	270	..

SPRING WHEAT.

Three varieties of spring wheat were grown in half-acre fields. They were sown on May 15 and 16. The results were as follows:—

Yields of Field Lots of Spring Wheat, Nappan, 1912.

Area.	Name of Variety.	Yield per Acre.	
Acres.		Bush.	Lb.
½	White Fife	23	14
½	Huron	19	..
½	Red Fife	17	30

EXPERIMENTAL STATION FOR CENTRAL QUEBEC. CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, G. A. LANGELIER.

WEATHER CONDITIONS, 1912.

The past season was the most unfavourable which the farmer of this district has experienced for a quarter of a century. The month of April was cold and the snow disappeared slowly. In May, seeding was retarded by the excessive rainfall, which occurred on fourteen different days between the seventh and the thirty-first. The wet weather continued into June, there being precipitation during thirteen of the first eighteen days of the month. This was followed by a drought which extended from the twentieth of June until the end of July. The land, which had been repeatedly flooded, was then parched and cracked, and the late sown crops germinated poorly. August was wet and cold, and those who delayed haying for finer weather found little opportunity to cure it properly. Grain grew well, but corn, potatoes and roots were at a standstill. September continued damp and cloudy, sunshine averaging only a little over three hours a day. Corn did not grow well, and was practically a total failure throughout the district. In October, rain fell on seventeen days, making it difficult to harvest the grain in good condition. Much of it was still green when cut, and seed, as a rule, was of poor quality. November continued dull. On the twenty-sixth the ground froze up so that no further field work could be done.

Some Weather Observations taken at Cap Rouge Experimental Station, 1912.

Month.	Temperature F.			Precipitation.			Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	
	°	°	°	Inches.	Inches.	Inches.	Hours.
January	34	−24·2	1·94	0·28	34·7	3·75	79·0
February	35	−19·2	9·00	....	21·5	2·15	63·3
March	43	−14·2	15·28	0·23	21·7	2·40	165·3
April	60	5·2	31·35	2·78	2·0	2·98	215·2
May	80	26·2	51·31	8·08	....	8·08	194·0
June	83	35·2	56·18	3·01	....	3·01	212·0
July	92	44·2	66·81	0·92	....	0·92	224·7
August	77	39·2	59·20	10·21	....	10·21	138·0
September	74	31·2	53·37	3·34	....	3·34	91·2
October	72	28·2	44·94	2·74	....	2·74	87·0
November	59	10·2	30·92	2·94	20·3	4·97	26·2
December	47	−13·2	16·83	1·04	20·2	3·06	39·5
Total	....	....	....	35·57	120·4	47·61	1,535·4

FIELD CROP YIELDS.

With the exception of hay, the yield of all crops was below average. No further explanation than the inclement weather need be given for the poor showing made, and indicated in the following table:—

FIELD Crop Areas and Yields, Cap Rouge, 1912.

Crop.	Variety.	Acreage.	Total Yield.	Yield per Acre.	
			Lb.		
Corn.....	Longfellow..	7·31	40,185	2 tons,	1,497 lb.
Turnips ..	Select Purple Top	3·00	33,790	5 "	1,263 "
Potatoes ..	Irish Cobbler	1·00	1,713	28 bush.	33 "
Oats (green.).	Banner	1·92	5,565	1 ton.	898 "
Oats (ripened)	Banner	25·46	22,632	26 bush.	5 "
Hay.....	Clover	27·15	108,600	2 tons.	
"	Timothy	21·75	65,250	1½ "	
	Total area in field crops	87·59			

ROTATION OF CROPS.

With a view to learning something of the relative value of different rotations, and of showing the advantages of a well-ordered succession of crops over long continued growing of the same crops, four rotations were inaugurated in 1911. The work with them has been continued, but we do not feel warranted in presenting any figures until we have the results of at least one more year's work. It will be noted that rotation 'J' is omitted from the number reported as having been started last year. It has been temporarily dropped to make room for the extension of the orchard. Rotation 'B' of five years' duration has been added, so that there are now under test the following:—

Rotation 'D' (three years' duration).

First year.—Corn, roots, potatoes, peas, and peas and oats mixed to cut for green feed or for hay.

Second year.—Oats. Seeded down with 10 pounds red clover, 6 pounds timothy, and 3 pounds alsike per acre.

Third year.—Clover hay. Two crops cut if possible.

Rotation 'C' (four years' duration).

First year.—Corn, roots, potatoes, peas, and peas and oats mixed to cut for green feed or for hay.

Second year.—Grain. Seeded down.

Third year.—Clover hay.

Fourth year.—Pasture.

Rotation 'B' (five years' duration).

First year.—Corn, roots, potatoes, peas, and peas and oats mixed for green feed or for hay.

Second year.—Grain. Seeded down.

Third year.—Clover hay.

Fourth year.—Grain. Seeded down.

Fifth year.—Clover hay.

Rotation 'K' (six years' duration).

First year.—Corn, roots, potatoes, peas, and peas and oats mixed for green feed or for hay.

Second year.—Grain. Seeded down.

Third year.—Hay.

Fourth year.—Hay.

Fifth year.—Pasture.

Sixth year.—Pasture.

PLANTING CORN IN HILLS AND DRILLS.

The experiment started in 1911 to learn the relative merits of sowing corn in drills and in hills in this climate and locality has been continued. The following table shows the results for each year, and the average for two years.

PLANTING Fodder Corn in Hills and Drills.

Method of Planting.	Yield 1911.	Yield 1912.	Average yield 2 years.
	Tons.	Tons.	Tons.
In drills 42 inches apart, 8 inches between plants..........	13·89	4·69	9·29
" 48 " 8 " "	13·82	3·83	8·82
In hills 42 " 42 " "	11·92	·83	6·37
" 36 " 36 " "	11·33	·68	6·00

The rather marked difference in favour of the drill-sown corn may be partly accounted for in 1912 by the nature of the season. The almost incessant rainfall prevented seeding until June 19. A long drought then followed. The corn sown in drills with the horse planter, was seeded deeper, and nearer moisture, than that sown in hills with the hand machine. The drilled corn, therefore, germinated more quickly and was cultivated at an earlier date, thus receiving an advantage at the outset that counted for much in that particular season. This test will be continued and reported upon next year.

EXPERIMENTAL FARM FOR MANITOBA, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT, W. C. McKILLICAN, B.S.A.

ROTATION OF CROPS.

There is a growing sentiment in the province of Manitoba in favour of increasing the number of live stock kept, growing more forage crops, and thus going in for that system of agriculture, known as mixed farming. This province has long been known as a grain-growing country. It seemed specially adapted to that purpose; the great fertility of the soil, the ease with which large areas could be cultivated, and the quality of the grain produced, all tended to make wheat production the mainstay of prairie farming. Thirty years of that method have begun to bring about the inevitable result. Weeds are becoming more prevalent, fertility is beginning to fail, and soil blowing is becoming more of a difficulty, each year. These difficulties are more perceptible on some farms than on others, depending on how well the land has been farmed.

The very essence of the advantage of mixed farming, is that it makes possible a more scientific rotation of crops than can be practised under grain growing. By causing the various crops to follow each other in the most desirable sequence, it is possible that the fertility and cleanliness of the land may be kept up, and that each crop may leave the land in a suitable condition for its successor. In order to get definite information as to what rotations are suited for Manitoban conditions, eight different rotations have been adopted for this Experimental Farm. Some of these have been in operation for a few years, others are partly in operation, and one has not yet been started.

In order that the results obtained in various years may be comparable, fixed valuations have been established upon which to calculate them. These valuations will be used from year to year, regardless of fluctuations in rates of wages and values of products. Thus, in some seasons the actual profits will really be greater than is shown, in others, when prices for products are low, the profits will be less. These constant values, however, permit of a fairer comparison of the different rotations, and of periods of years within a single rotation.

The following values have been fixed:—

Return values.

Wheat (from the machine)	per lb.	$1\frac{1}{3}$c.
Barley " "	"	1c.
Oats " "	"	1c.
Peas " "	"	$1\frac{1}{2}$c.
Flax " "	"	3c.
Timothy hay	per ton.	$10 00
Red Clover hay	"	10 00
Alfalfa hay	"	12 00
Brome Grass hay	"	10 00
Western Rye Grass hay	"	10 00
Mixed hay	"	10 00
Green hay	"	10 00
Oat straw	"	2 00
Barley straw	"	2 00
Wheat straw	"	1 00
Pea straw	"	2 00
Flax straw	"	2 00
Dry corn stalks	"	5 00
Corn ensilage	"	3 00
Mangels and turnips	"	3 00
Sugar beets	"	4 00
Pasture, each horse	per month.	1 00
" " cow	"	1 00
" " sheep	"	25

Cost values.

Rent	per acre.	2 00
Barnyard manure spread on fields (charged equally over all years of the rotation)	per ton.	1 00
Seed wheat	per acre.	1 50
Seed oats	"	1 00
Seed barley	"	1 00

(All other seeds to be charged at actual cost. Cost of grass seed to be charged equally on the years producing grass. Twine charged at actual cost.)

Machinery	per acre.	60
Manual labour	per hour.	19

Horse labour (including teamster)—

Single horse	per hour.	27
Two-horse team	"	34
Three-horse team	"	41
Four-horse team	"	48
Additional horses	each hour.	7

(Work done by traction engine is to be converted into the amount of horse labour required to do the work, and charged accordingly.)

Threshing (covering work from stook to granary)—

Wheat	per bush.	7
Oats	"	4
Barley	"	5
Flax	"	12
Peas	"	7

Rotation 'D' (four years' duration).

First year.—Wheat.

Second year.—Wheat. Manured preceding fall at rate of 3 tons per acre.

Third year.—Oats.

Fourth year.—Summer-fallow.

This is a typical grain-farming rotation, except that manure is applied every four years. The first crop of wheat is sown on summer-fallowed land. After the crop is harvested the land is manured in the fall and then ploughed. A second crop of wheat is then sown. The stubble is ploughed in the fall, if possible, and a crop of oats is grown the following year. The land is summer-fallowed in the fourth year, in preparation for wheat again. The soil on which this rotation is located is a black loam, varying from clayey to sandy. Operations were commenced on this rotation in 1910, and it has been in full operation in 1911 and 1912.

Rotation 'E' (four years' duration).

First year.—Wheat.

Second year.—Wheat.

Third year.—Oats.

Fourth year.—Summer-fallow.

This is identically the same rotation as 'D,' except that no manure is applied at any time. It is the same rotation as used by many of the best grain farmers in Manitoba. The operations have been exactly the same as on 'D,' except for the application of manure. The land is the same as 'D,' each field lying contiguous to the corresponding field in 'D.'

Rotation 'F' (five years' duration).

First year.—Wheat.

Second year.—Wheat.

Third year—Corn or roots. Manured preceding fall.

Fourth year.—Oats or barley Seeded with grass and clover.

Fifth year.—Clover hay.

This is a mixed-farming rotation for conditions where there is such a sufficiency of permanent pasture that it does not have to be included in the rotation. It provides hay and corn or roots, for stock, and substitutes the latter crops for summer-fallow. It produces a crop, on every field, every year. It gives two-fifths of the land to wheat.

The first year, wheat is sown on the clover sod of the former fifth year. After the wheat is taken off, the land is fall ploughed. Wheat is sown again the second year. The land is then manured in the fall, and either fall or spring ploughed. The third year corn is planted, and the land is kept clean by frequent intertillage. Barley or oats is sown the fourth year on the corn stubble, without ploughing. Along with the barley or oats is sown a mixture of 3 pounds of timothy, 5 pounds of western rye grass and 8 pounds of red clover per acre. The fifth year, a crop of hay, largely clover, is harvested. As soon as the hay is off, the land is ploughed, and worked up for the wheat of the first year again.

The soil on which this experiment is located is black loam and is mostly of a fairly heavy clay mixture. This rotation was begun in 1910, and by this year (1912), was almost in full operation. The only exception was a piece of three acres in the field allotted to corn; this piece was rather bad with couch grass, and was given an exceptionally thorough summer-fallowing in an effort to get rid of this pest.

Rotation 'G' (six years' duration).

First year.—Wheat.

Second year.—Wheat.

Third year.—Oats and barley. Seeded with grass and clover.

Fourth year.—Clover hay.

Fifth year.—Pasture.

Sixth year.—Corn or roots. Manured preceding fall.

This is a mixed-farming rotation which provides for one-third of the farm in wheat and, in addition, gives a good area to different kinds of feed for live stock, including pasture. The latter necessitates the building of divisional fences between the fields.

The wheat of the first year is sown among the stubble of the corn of the sixth year, without ploughing. The trash from the corn is raked off and burned, and the land harrowed. After the first crop of wheat is harvested the land is fall ploughed for a second crop. After the second crop, it is again fall ploughed. The third crop is oats or barley, and with it is sown a mixture of 5 pounds of timothy and 8 pounds of red clover, per acre. The fourth year, there is a crop of hay, mostly clover. As soon as it is removed, the aftermath is used for pasture. The fifth year is pasture, up till about the middle of July or first of August, when the aftermath of the hay field is ready to carry the stock. The pasture is then manured, and ploughed under. There having been only two years of grass, the sod is not very hard to plough, and does not need to be backset. The sixth year is corn or roots. These are thoroughly cultivated, so that the land is left as clean as a good summer-fallow, and is ready for wheat again, without ploughing.

The land used for rotation 'G' is a heavy clay loam. This rotation was the first started on the Farm, and has been in full operation several years.

The amount of hand labour expended on the corn this year was exceptional, and is due to a set of circumstances, including poor seed, late spring, dry June, and very wet July, which made extra efforts necessary if the field were to be kept clean.

Rotation 'H' (six years' duration).

First year.—Wheat.

Second year.—Wheat.

Third year.—Summer-fallow.

Fourth year.—Oats. Seeded with grass and clover.

Fifth year.—Hay.

Sixth year.—Pasture. Manured.

This is a mixed-farming rotation, suitable for those who do not wish to grow corn or roots on a large scale. It gives one-third of the land to wheat, and one-sixth each to oats, hay and pasture. It requires divisional fences on account of the pasture.

The rotation is located on heavy clay land. A change has been made in the nature of this rotation, and this year, 1912, is the first year of the present order of crops. The land on which it is located is rather badly infested with couch grass. An effort is being made to put it in good shape. However, at the present time, it is not fair to the rotation to publish a comparison of results, obtained here, as contrasted with results obtained on land in good condition.

Rotation 'I' (six years' duration).

First year.—Flax.
Second year.—Oats.
Third year.—Summer-fallow.
Fourth year.—Wheat. Seeded with grass and clover.
Fifth year.—Hay.
Sixth year.—Pasture. Manured.

This rotation is very similar to 'H,' the difference being that one crop of wheat is replaced by flax, and the position of the other crop of wheat is changed with the oats, so that the seeding down is with wheat. This rotation is in the present order this year for the first time. It occupies half of the same fields as occupied by 'H,' and is under the same disadvantage as regards couch grass.

The seeding mixture for both 'H' and 'I' is as follows: 8 pounds western rye grass, 6 pounds red clover and 2 pounds alsike per acre.

Rotation 'Q' (eight years' duration).

First year.—Roots and peas.
Second year.—Wheat or oats. Seeded with grass and clover.
Third year.—Hay.
Fourth year.—Hay.
Fifth year.—Pasture.
Sixth year.—Pasture.
Seventh year.—Pasture.
Eighth year.—Green feed and rape. Manured in fall.

This rotation is located in a piece of poor, gravelly soil, on the high land, at the rear of the Experimental Farm. It is used as a sheep farm, and the rotation is arranged accordingly. The first year is divided between peas and turnips. They are sown on land that grew green feed and rape the year before, and was manured and fall ploughed. The next year, the field is seeded down, with oats or wheat as a nurse crop. Two years of hay and three of pasture follow. In the last year of pasture, the land is ploughed in midsummer, and backset the following spring. A crop of green feed (peas and oats), and a crop of rape for pasture, are grown the last year. The land is then manured, and ploughed for the first year crops again.

This rotation was in partial operation in 1911 and 1912, but is not yet in complete operation.

Rotation 'W' (ten years' duration).

First year.—Wheat.
Second year.—Wheat.
Third year.—Corn or roots.
Fourth year.—Oats.
Fifth year.—Barley.
Sixth year.—Alfalfa. Seeded without nurse crop.
Seventh year.—Alfalfa.
Eighth year.—Alfalfa.
Ninth year.—Alfalfa.
Tenth year.—Alfalfa.

This is distinctly an alfalfa rotation. For the use of this crop it is necessary to have a long rotation, as the alfalfa is expensive to seed, and takes some time to reach its highest production. This rotation would be best suited to a dairy or stock farm, as half the land is alfalfa.

The soil on which rotation 'W' is used, is heavy clay. This rotation has not yet been started. All that has been done is to allot a block of land, and get most of it seeded to alfalfa. The land has not as yet been subdivided. The first year wheat will be sown on land that grew alfalfa for four years and was ploughed in midsummer after the first cutting of the last year of alfalfa was taken off. After fall ploughing, another crop of wheat will be taken off. The land will then be heavily manured, and sown to corn or roots. Following the hoed crop, oats will be sown, without ploughing. Following the oats, a crop of early maturing barley (probably beardless) will be grown, and the land given a partial summer-fallow, either before the barley is sown or after it comes off. The next year, alfalfa will be sown without a nurse crop. Three full years of alfalfa hay, and a first cutting of the fourth year, will be harvested. The land will then be ploughed in midsummer, and made ready for wheat again.

The details of costs, returns and profits of rotations 'D,' 'E,' 'F' and 'G' are given in the following table:—

ROTATION

Rotation Year.	Location.	Area.	Crop.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Horse labour (including teamster). Hours. Single horse.	2-horse team	3-horse team	4-horse team	Cost of horse labour.
		Ac.	1912.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	$ c.
D 4..	Plot 1..	3·5	Summer-fallow..	7 00	2 10	......	......	......	2½	..	20¼	10 57
D 3..	" 2..	3·5	Oats	12 25	6 86	7	1 33	......	14¾	3	12	12 00
D 2..	" 3..	3·5	Wheat....	12 25	8 07	6	1 14	......	9½	4	13½	11 35
D 1..	" 4..	3·5	Wheat	7 00	8 79	7	1 33	. ....	5½	5	......	3 92
	Aggregate											
	Average per acre in 1912											

ROTATION

E 4...	Plot 1 .	3·5	Summer-fallow..	7 00	2 10	......	......	......	2½	......	20¼	10 57
E 3...	" 2..	3·5	Oats............	7 00	6 83	7	1 33	......	14¾	3	12	12 00
E 2..	" 3..	3·5	Wheat	7 00	8 07	6	1 14	......	9½	4½	13½	11 55
E 1...	" 4..	3·5	Wheat....	7 00	8 79	7	1 33	......	5½	5	....	3 92
	Aggregate......											
	Average per acre in 1912											

ROTATION

F 5...	Plot 1..	8·0	Wheat	16 00	18 96	14	2 66	......	27½	37	5	26 92
F 4...	" 2..	8·0	Wheat	16 00	20 28	12	2 28	......	11½	8	6½	10 31
F 3...	" 3..	8·0	Hay....	16 00	26 16	25	4 75	2	27½	......	... ..	6 49
F 2...	" 4..	8·0	Barley..........	28 80	15 68	12	2 28	....	28½	15½	...	16 04
F 1.	" 5..	8·0	Corn.....	28 80	23 00	144½	27 45	25	123½	63	15½	82 01
	Aggregate........											
	Average per acre in 1912											

ROTATION

G 4..	Plot 1..	6·0	Hay.....	12 00	10 50	19	2 61	.. . .	12½	... .	......	4 25
G 3..	" 2..	6·0	Barley	12 00	12 24	6	1 14	......	24	4	20	19 20
G 2..	" 3..	6·0	Wheat........	20 00	14 40	10	1 90	......	25	9	18	26 83
G 1..	" 4..	6·0	Wheat	20 00	15 30	9	1 71	.....	25	6	....	10 96
G 6..	" 5..	6·0	Corn...........	20 00	17 88	273½	51 97	15½	60	12	28	42 34
G 5..	" 6..	6·0	Pasture.........	12 00	13 80	.....	......	....	......	......	......	....
	Aggregate											
	Average per acre in 1912											

"D."

in raising Crop.					Particulars of Crop.							
					Weight in Pounds.							
Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bus. or 1 ton.	Height of stubble.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre.	Notes.
$ c.	$ c.	$ c.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.	
......	19 67	5 62	.....	.....	......	......	.....	......	......	......	-5 62	
8 20	40 64	11 61	0 20	....	6,970	8,400	......	......	78 10	22 31	10 70	
5 53	38 34	10 96	0 48	......	4,740	4,800	......	.....	65 60	18 74	7 78	
9 10	30 14	8 61	0 43	......	7,800	9,600	.....	......	108 80	31 08	22 47	S.F. 1911 cost $7.46 per acre.
......	128 79	.. .	.....	......	.....	......	.....	....	252 50	......	.....	
......	.....	9 20	.....	......	......	.....	.....	....	.....	18 03	8 83	

"E."

......	19 67	5 62	.....	......	......	......	......	......	.....	..	-5 62	
7 40	34 56	9 87	0 19	......	7,072	8,400	....	......	71 30	20 37	10 50	
4 65	32 41	9 26	0 49	.....	3,900	4,800	.....	......	54 40	15 54	6 28	
9 10	30 14	8 61	0 43	....	7,800	9,600	......	......	108 80	31 08	22 47	S.F. 1911 cost $7.46 per acre.
......	116 78	.....	......	......	......	.....	......	.....	234 50	.....	......	
......	......	8 34	......	......	.....	.....	......	.....	......	16 75	8 41	

"F."

13 23	77 77	9 72	0 45	......	11,340	14,400	......	.....	158 40	19 80	10 68	
22 40	71 27	8 91	0 49	...	19,200	22,800	......	.....	267 40	33 43	24 52	
.. .	53 40	6 68	......	......	.....	...	12,170	......	60 85	7 61	0 93	
22 10	84 90	10 61	0 19	. ..	21,216	19,200	......	.....	241 36	30 17	19 50	
41 25	202 51	25 31	......	......	.....	....	....	110,000	165 00	20 62	-4 69	3 acres S.F. for couch grass, hence loss.
..	489 85		......	.....	......	......	......	.....	893 01	......	...	
......	......	12 25	......	......	......	......	..	..	...	22 33	10 0[illegible]	

"G."

.. .	29 36	4 89	.....	.....	......	.....	14,000	......	97 00	16 17	11 28	Pasture on aftermath worth $27.
17 00	61 58	10 26	0 18	......	16,320	16,800	.....	......	180 00	30 00	19 74	
13 37	70 50	11 75	0 37	......	11,460	12,000	. ...	.....	158 80	26 47	14 72	
15 19	63 16	10 53	0 29	.....	13,020	18,000	....	...	182 60	30 43	19 90	
42 75	174 94	29 16	......	......	......	.....	......	114,000	171 00	28 50	-0 66	
......	25 80	4 30	.....	......	......	......	......	.. .	54 00	9 00	4 70	Pastured 18 cattle 3 m.
......	425 34	.. ...	......	......	......	......	......	......	843 40	....	.....	
......	.. ..	11 81	......	......	......	......	......	......	.. ..	23 43	11 62	

CULTURAL EXPERIMENTS.

The work of inaugurating the system of cultural experiments has made progress during the year. All the operations which the system called for have been carried out. On most of the experiments, the preparatory work has been completed, and results should now be obtained. On some experiments, where several years of preparation are necessary, the work has not yet reached the stage where results are expected.

Operations commenced on the cultural plots on April 29, but wet weather prevented further operations until May 9. Spring ploughing and other spring work was accomplished with difficulty on account of the wet condition of the soil. Later on, the weather turned very dry, and the germination of turnips and rape was uneven. During the hot dry weather of June, a difference could be observed in the plots under the various methods of treatment. The heavy rains of July caused an excessive growth of straw, and a large amount of secondary shooting. Oats and barley lodged very badly, and it was impossible to entirely avoid waste in harvesting. As a result of these peculiar weather conditions, the results obtained are almost valueless. Methods that theory and practice have heretofore shown to be objectionable, have produced just as good yields as the best methods; in some cases, such as in depth of ploughing, the results that would be expected are practically reversed. The year's results are, therefore, quite disappointing; instead of giving some definite information, as was expected, the figures are largely contradictory and confusing. We report the yields, as they occurred, for what they may be worth.

DEPTH OF PLOUGHING WHEAT STUBBLE TO BE SOWN TO OATS.

The wheat stubble was ploughed and disced the preceding fall. The oats were sown May 16. All plots came up on May 27, headed on July 17, were cut on September 10 and were threshed on September 25.

Depth of Ploughing Wheat Stubble to be sown to Oats.

Plot No.	Depth of Ploughing Wheat Stubble, fall of 1911.	Yield of Oats per acre, 1912.	
		Grain.	Straw.
		Lb.	Lb.
1	Ploughed 3 inches deep	2,800	3,200
2	Ploughed 4 inches deep	2,680	3,320
3	Ploughed 5 inches deep	2,800	4,400

DEPTH OF PLOUGHING SUMMER-FALLOW TO BE SOWN TO WHEAT.

The land was ploughed on June 15, 1911, was packed and harrowed after ploughing, and was cultivated twice afterwards, during the summer, with a stiff tooth cultivator, and harrowed after the first cultivation. Wheat was sown on all plots on May 13, 1912, after a double harrowing. All plots came up on May 22, headed on June 8, were cut on August 7 and threshed on September 12.

DEPTH of Ploughing Summer-fallow to be sown to Wheat.

Plot No.	Depth of Ploughing Summer-fallow, 1911.	Yield of Wheat per acre, 1912.	
		Grain.	Straw.
		Lb.	Lb.
1	Ploughing 3 inches deep	2,600	2,600
2	Ploughing 4 inches deep	2,560	3,680
3	Ploughing 5 inches deep	2,400	2,880
4	Ploughing 6 inches deep	2,400	2,880
5	Ploughing 7 inches deep	2,240	3,520
6	Ploughing 8 inches deep	2,480	2,800
7	Ploughing 5 inches deep and subsoiling 4 inches	2,440	2,400
8	Ploughing 6 inches deep and subsoiling 4 inches	2,160	3,220
9	Ploughing 7 inches deep and subsoiling 4 inches	2,520	3,240
10	Ploughing 8 inches deep and subsoiling 4 inches	2,040	3,340

DEPTH OF PLOUGHING SOD TO BE SOWN TO WHEAT.

There has not been time to get results on this part of the experiment, as the first grass seed was sown in 1911; and, consequently, there was no sod to plough up the same season. Sod has been ploughed, the various depths, in 1912, and the 1913 crop will give the yields produced thereon.

SUMMER-FALLOW TREATMENT.

The plots on which this year's results are obtained, were summer-fallowed in 1911. With the exception of plots 11 and 13, they were ploughed on June 14, 1911. Those getting a second ploughing, received it on September 28, 1911. The other operations, during the summer, were according to the methods outlined below. Wheat was sown on May 10, and, with the exception of plot 10, came up on May 19. On plot 10, it came up on May 21. All headed out on July 6, were ripe on August 26, cut on August 28 and threshed on September 12.

TREATMENT of Summer-fallow to be sown to wheat.

Plot No.	Treatment of Summer-fallow, 1911.	Yield of Wheat per Acre, 1912.	
		Grain.	Straw.
		Lb.	Lb.
1	Plough 4 inches, June, pack if necessary and practicable, cultivate as necessary	2,560	5,360
2	Plough 6 inches, June, pack if necessary and practicable, cultivate as necessary	2,560	4,640
3	Plough 8 inches, June, pack if necessary and practicable, cultivate as necessary	2,760	4,040
4	Plough 4 inches, June, cultivate. Plough 4 inches, September, harrow	2,400	4,440
5	Plough 6 inches, June, cultivate. Plough 6 inches, September, harrow	2,720	3,680
6	Plough 8 inches, June, cultivate. Plough 8 inches, September, harrow	2,280	4,320
7	Plough 6 inches, June, cultivate. Plough 4 inches, September, harrow	2,400	4,200
8	Plough 4 inches, June, cultivate. Plough 6 inches, September, harrow	2,320	4,520
9	Plough 4 inches, June, early as possible, cultivate. Plough 6 inches, September, leave untouched	2,240	4,160
10	Plough 5 inches, June, seed to rape or other green forage crop and pasture off	2,320	4,280
11	Plough 6 inches, May 15, harrow and pack if necessary, cultivate as necessary	2,720	5,200
12	Plough 6 inches, June 15, harrow and pack if necessary, cultivate as necessary	2,520	4,280
13	Plough 6 inches, July 15, harrow and pack if necessary, cultivate as necessary	2,440	4,760
14	Fall cultivate before summer-fallowing. Plough 6 inches, June, harrow and pack if necessary, cultivate as necessary.	2,440	5,480
15	Fall plough, 4 inches, before summer-fallowing. Plough 6 inches, June, harrow and pack if necessary, cultivate as necessary.	2,720	5,640
16	Plough 6 inches, June, pack, cultivate as necessary	2,760	4,440
17	Plough 6 inches, June, no packing, otherwise same as other plots	2,600	5,020

STUBBLE TREATMENT.

The plots on which this experiment was conducted, grew wheat in 1911. The treatment of the stubble was performed, according to directions given below, in the fall of 1911 and spring of 1912. Wheat was sown on plots 1 to 10, on May 13; they all came up on May 23; plots 3, 4 and 5 headed out on July 6; plots 1, 2, 6, 7, 8, 9 and 10 headed out on July 8. All ripened on August 28, were cut on August 31, and threshed on September 25. Plots 11, 12 and 13 were sown to oats on May 16. All came up on May 28, headed out on July 20, were ripe on September 11, were cut on September 11 and threshed October 3.

TREATMENT of Wheat Stubble to be sown to Wheat.

Plot No.	Treatment given Wheat Stubble preceding Wheat.	Yield of Wheat per acre, 1912.	
		Grain.	Straw.
		Lb.	Lb.
1	Plough, autumn	1,720	2,680
2	Disc harrow, autumn	2,080	3,200
3	Burn stubble—then disc, autumn	2,120	2,720
4	Burn stubble—then plough, autumn	1,900	2,900
5	Burn stubble in spring—seed at once	2,280	3,320
6	Plough in spring—seed at once	2,280	3,320
7	Disc at cutting time—spring plough	1,920	3,800
8	Disc at cutting time— autumn plough	2,040	3,960
9	Plough, autumn—subsurface pack at once	2,280	3,720
10	Plough, spring—seed—subsurface pack	1,680	3,120

TREATMENT of Wheat Stubble to be sown to Oats.

Plot No.	Treatment given Wheat Stubble preceding Oats.	Yield of Oats per acre, 1912.	
		Grain.	Straw.
		Lb.	Lb.
11	Plough, autumn—subsurface pack at once	3,400	3,800
12	Plough, spring—seed, subsurface pack	3,320	3,880
13	Cultivate, autumn—spring plough, seed	3,640	3,160

SEEDING TO GRASS AND CLOVER.

The various operations that were called for this year, in this experiment, were carried through. As several years' preparatory work are necessary, in growing the different crops which precede the seeding down, it has not been possible to obtain results as yet.

The following are the methods being tested in this experiment:—

1. Seeding Rye grass 10 pounds, and red clover 10 pounds with nurse crop on summer-fallow.
2. Seeding Rye grass 10 pounds, and red clover 10 pounds, alone after summer-fallow.
3. Seeding Rye grass 10 pounds, and red clover 10 pounds, with nurse crop on first year after hoed crop.
4. Seeding Rye grass 10 pounds, and red clover 10 pounds, alone after hoed crop.
5. Seeding Rye grass 10 pounds, and red clover 10 pounds, with nurse crop on first year wheat stubble.
6. Seeding Rye grass 10 pounds, and red clover 10 pounds, alone after first year wheat.
7. Seeding Rye grass and red clover with oats to cut green on first year wheat stubble.
8. Seeding Rye grass 10 pounds, and red clover 10 pounds, alone on first year wheat stubble, manure 8 tons per acre, ploughed preceding fall.
9. Seeding Rye grass 10 pounds, and red clover 10 pounds, with nurse crop on second year wheat stubble.
10. Seeding Rye grass 10 pounds, and red clover 10 pounds, alone after second year grain (oats).
11. Seeding Rye grass 10 pounds, and red clover 10 pounds, with nurse crop on second year after hoed crop.

BREAKING SOD FROM CULTIVATED GRASSES AND CLOVERS.

As the block of land allotted to this experiment was not in sod at the start, it was first necessary to grow the sod. The land was seeded down in 1911, produced a crop of hay this year (1912), and will be ready for the first set of plots to be broken up in 1913.

The following methods are to be tried in this experiment:—

1. Plough July 20 to 30, 5 inches deep. Pack and disc at once—disc in fall.
2. Plough October, 5 inches deep. Pack—disc harrow.
3. Plough early July, 3 inches deep. Backset September, cultivate as necessary.
4. Stiff teeth rip July—plough 5 inches deep September—cultivate.
5. Spring plough. 5 inches deep—seed same spring to wheat.
6. Duplicate No. 5—sow flax.
7. Repeat No. 5—sow peas.
8. Plough May 15—work as summer-fallow.

APPLICATION OF BARNYARD MANURE.

Two years' work have now been put on these experiments, and the various operations have been carried out each season. A third year is necessary on many of the plots before comparative results are obtained, as most of the work, in these two seasons, has been of a preparatory nature.

The following methods of applying manure are being tried:—

For Corn.

1. No manure, second year stubble, ploughed in autumn.
2. Apply on surface in autumn after ploughing second year stubble, and work in at once.
3. Apply in spring on surface of ploughed land, second year stubble, and work in at once
4. Plough in autumn right after applying, second year stubble.
5. Plough in spring right after applying, second year stubble.
6. Winter apply, plough in spring, second year stubble.
7. Winter apply, green manure (cut straw) on second year stubble—plough in spring.
8. Winter apply, green manure (cut straw) on summer-fallow—disc in.
9. Summer-fallow—no manure.

For Wheat.

1. Apply in winter green manure (cut straw) first year stubble—disc in.
2. Apply in winter green manure (cut straw) summer-fallow—disc in.
3. Apply with spreader after grain sown on first year stubble.
4. Apply with spreader after grain sown on summer-fallow.
5. No manure—fall ploughed—first year stubble.
6. Apply on surface first year stubble and plough in, in autumn.
7. Apply on surface first year stubble and plough in, in spring.
8. No manure—disc—first year stubble.
9. No manure—burn stubble.

For Barley.

1. Apply in winter green manure (cut straw) on first year stubble—disc in.
2. Apply in winter green manure (cut straw) on summer-fallow, sow barley on summer-fallow.
3. Apply with spreader after barley sown on first year stubble.
4. Apply with spreader after seeding barley on summer-fallow.
5. No manure—fall ploughed—first year stubble.
6. Apply on surface first year stubble and plough in, in autumn.
7. Apply on surface first year stubble and plough in, in spring.
8. No manure—disc—first year stubble.
9. No manure—burn stubble.

For Oats.

1. Apply in winter green manure (cut straw) first year stubble—disc in.
2. Apply in winter green manure (cut straw) summer-fallow—disc in.
3. Apply with spreader after grain sown on first year stubble.
4. Apply with spreader after grain sown on summer-fallow.
5. No manure—fall ploughed—first year stubble.
6. Apply on surface first year stubble and plough in, in autumn.
7. Apply on surface first year stubble and plough in, in spring.
8. No manure—disc—first year stubble.
9. No manure—burn stubble.

GREEN MANURING.

In this experiment the plots were given the treatment described below in 1911, and were sown to wheat in the spring of 1912. Plots 1, 5 and 6 were ploughed on June 15, 1911. The crops of green peas and tares were ploughed in, on plots 2, 3 and 4, on July 15, 1911. Manure was applied on plot 5 on October 20, 1911. Wheat was sown on all these plots on May 11, 1912. All came up on May 20. Plot 5 headed out on July 4 and the others on July 8. All ripened on August 28, were cut on August 31 and threshed on September 25.

GREEN Manuring for Wheat, followed by Oats.

Plot No.	Treatment of land year previous to Wheat.	Yield of Wheat per acre, 1912.	
		Grain.	Straw.
		Lb.	Lb.
1	Summer-fallow	2,320	5,160
2	Peas, two bushels Golden Vine (or other similar variety) ploughed under early in July	2,280	4,520
3	Peas, two bushels Golden Vine, ploughed under when in blossom	2,240	5,240
4	Tares, one bushel per acre, ploughed under late July	2,520	3,960
5	Summer-fallow. Barnyard manure, 12 tons per acre, applied on summer-fallow in September	2,680	4,800
6	Summer-fallow	2,920	3,880

SEED BED PREPARATION.

This experiment was conducted with wheat sown on summer-fallow. The summer-fallowing had been equally well done on all plots. The plot called 'poor preparation' was harrowed once, the one called 'good preparation' was harrowed twice, and the one called 'extraordinary preparation' was harrowed four times. The wheat was sown on May 9; it came up on May 20, on plots 2 and 3, and on May 22, on plot 1. All ripened on August 28, were cut on August 31 and threshed September 25.

PREPARATION of Seed Bed for Wheat.

Plot No.	Treatment given.	Yield of Wheat per acre, 1912.	
		Grain.	Straw.
		Lb.	Lb.
1	Poor preparation	1,440	3,760
2	Good preparation	1,640	5,160
3	Extraordinary preparation	1,560	5,640

This experiment was also conducted with oats on fall-ploughed wheat stubble. The land was ploughed on October 23. The 'poor preparation' plot was sown after ploughing and packing only. The 'good preparation' plot was ploughed, harrowed twice and packed. The 'extraordinary preparation' plot was ploughed, harrowed four times and packed. The oats were sown on May 14, came up on all plots on May 26, headed on July 17, were ripe on September 10, cut on September 10 and threshed on October 2.

PREPARATION of Seed Bed for Oats.

Plot No.	Treatment given.	Yield of Oats per acre, 1912.	
		Grain.	Straw.
		Lb.	Lb.
1	Poor preparation	3,040	4,960
2	Good preparation	3,640	4,760
3	Extraordinary preparation	3,640	4,360

SOIL PACKERS.

Packing for Wheat sown on Summer-fallow.

The plots for this experiment were all summer-fallowed in 1911. Plots 15 to 20 were packed, after ploughing, as described in the following table. The ploughing was all done on June 14. Packing and other spring work was done on May 10 and 11. All plots were sown to wheat on May 10, all came up on May 19; plots 2, 6, 7, 8, 9, 10, 18, 19 and 25 headed out on July 4, plots 3, 4, 11, 12, 13, 14, 15, 16, 17 and 21 headed out on July 6; plots 1, 22, 23 and 24 headed out on July 8. All ripened on August 26 and were cut on August 28.

SOIL Packing in Preparation for Wheat following Summer-fallow.

Plot No.	Cultural Treatment Given.		Yield of Wheat per Acre, 1912.	
			Grain.	Straw.
			Pounds.	Pounds.
1	Harrow, seed	Spring work when seeding.	2,440	3,160
2	" surface pack		2,920	3,080
3	" " harrow		2,640	3,360
4	" subsurface pack		2,780	3,620
5	" " harrow		2,680	4,120
6	" combination pack		2,640	3,360
7	" " harrow		2,680	3,320
8	Surface pack, seed, surface pack		2,400	3,200
9	Subsurface pack, seed, subsurface pack		2,520	3,880
10	Combination pack, seed, combination pack		2,480	3,920
11	Surface pack, harrow, seed		2,560	3,440
12	Subsurface pack, harrow, seed		2,300	3,700
13	Combination pack, harrow, seed		2,560	3,840
14	Harrow, seed		2,480	3,520
15	Plough for summer-fallow, surface pack, cultivate; next spring, smoothing harrow, seed		2,440	3,960
16	Plough for summer-fallow, subsurface pack, cultivate; next spring, smoothing harrow, seed		2,320	4,080
17	Plough for summer-fallow, combination pack, cultivate; next spring, smoothing harrow, seed		2,400	3,000
18	Plough for summer-fallow, surface pack, cultivate; next spring, smoothing harrow, seed, surface pack		2,600	3,560
19	Plough for summer-fallow, subsurface pack, cultivate; next spring, smoothing harrow, seed, subsurface pack		2,480	3,920
20	Plough for summer-fallow, combination pack, cultivate; next spring, smoothing harrow, seed, combination pack		2,680	5,000
21	Harrow, seed	Spring work when seeding.	2,600	2,860
22	" harrow when 6 inches high		2,560	3,840
23	" surface pack when 6 inches high		2,560	4,280
24	" roll when 6 inches high		2,520	4,280
25	"		2,360	5,120

Packing for Wheat Sown on Spring-Ploughed Stubble Land.

The plots on which this part of the experiment was conducted were in wheat the previous year. They were all ploughed April 29. The harrowing and packing was done on May 10 and 11. Wheat was sown on May 10; all plots came up on May 21. Plots 4, 5 and 6 headed on July 4; plots 8 and 10 headed on July 6, and plots 1, 2, 3, 7, 9 and 11 headed on July 8. All ripened on August 26, were cut on August 30 and threshed on September 25.

Soil Packing for Wheat sown on Spring-ploughed Stubble Land.

Plot No.	Cultural Treatment Given.	Yield of Wheat per Acre, 1912	
		Grain.	Straw.
		Pounds.	Pounds.
1	Harrow, subsurface pack, harrow, seed	2,080	3,920
2	Harrow, surface pack, harrow, seed	2,400	4,000
3	Harrow, combination pack, harrow, seed	2,360	3,640
4	Harrow, subsurface pack, harrow, seed, subsurface pack	2,280	3,720
5	Harrow, surface pack, harrow, seed, surface pack	2,440	4,360
6	Harrow, combination pack, harrow, seed, combination pack	2,240	3,760
7	Harrow, seed, harrow	2,160	3,840
8	Harrow, seed, surface pack	2,080	3,520
9	Harrow, seed, subsurface pack	2,640	3,960
10	Harrow, seed, combination pack	2,120	3,080
11	Harrow, seed	2,080	3,520

Packing for Wheat sown on Fall-Ploughed Stubble Land.

The plots on which this part of the experiment was conducted were in wheat the previous year. They were all ploughed on October 5, and no further work was done during the fall. The harrowing and packing was done on May 10 and 11. Wheat was sown, on all plots, on May 10. All came up on May 20. Plots 23, 24 and 25 headed out on July 4; the remainder headed on July 6. All ripened on August 26, were cut on August 30 and threshed on September 25.

SOIL Packing for Wheat sown on Fall-Ploughed Stubble Land.

Plot No.	Cultural Treatment Given.	Yield of Wheat per Acre, 1912. Grain.	Straw.
		Pounds.	Pounds.
12	No packer, harrow, seed	2,040	3,960
13	Subsurface pack in fall, seed in spring	2,080	4,720
14	Subsurface pack in spring, then seed	2,000	4,400
15	Subsurface pack in spring, after seeding	2,120	4,280
16	Surface pack in fall, seed in spring	2,080	3,920
17	Surface pack in spring, then seed	2,200	3,400
18	Surface pack in spring, after seeding	2,120	3,480
19	Combination pack in fall, seed in spring	2,040	3,960
20	Combination pack in spring, then seed	2,000	4,000
21	Combination pack in spring, after seeding	1,800	3,000
22	No packer, harrow, seed	1,920	3,280
23	Surface pack in fall, seed, surface pack	1,800	4,200
24	Subsurface pack in fall, seed, subsurface pack	2,000	3,600
25	Combination pack in fall, seed, combination pack	1,760	3,040

DEPTH OF SEEDING.

This experiment was tried with wheat on summer-fallow. The land was given the usual good cultivation. Wheat was sown, on all plots, on May 13. Plots 1 and 2 came up on May 22, plot 3 on May 23 and plot 4 on May 24. Plots 1 and 2 headed out on July 8 and plots 3 and 4 on July 10. All ripened on August 26, were cut on August 27 and threshed on September 12.

DEPTHS of Seeding Wheat.

Plot No.	Depths Sown.	Yield of Wheat per Acre, 1912. Grain.	Straw.
		Pounds.	Pounds.
1	Sowing 1 inch deep	2,200	3,000
2	Sowing 2 inches deep	2,440	3,280
3	Sowing 3 inches deep	1,880	2,920
4	Sowing 4 inches deep	2,000	2,840

This experiment was also tried with oats, on wheat stubble. The stubble land was ploughed on October 24, the previous fall, and was worked into good tilth in the spring.

Oats were sown, on all plots, on May 16. Plots 1 and 2 came up on May 27, and plots 3 and 4 on May 28. All plots headed out on July 17, ripened on September 10, were cut on September 10 and threshed on October 2.

DEPTHS of Seeding Oats.

Plot No.	Depths Sown.	Yield of Wheat per Acre, 1912.	
		Grain.	Straw.
		Pounds.	Pounds.
1	Sowing 1 inch deep	3,000	4,200
2	Sowing 2 inches deep	2,840	4,760
3	Sowing 3 inches deep	2,960	2,440
4	Sowing 4 inches deep	3,120	3,280

COMMERCIAL FERTILIZERS.

The plots for this experiment grew wheat in 1911, and the fertilizers were applied when the wheat was sown. This year they grew oats, without any further fertilizing. The oats were sown on May 14; all plots came up on May 26, headed out on July 17, ripened on September 10, were cut on September 11 and threshed on October 3.

APPLICATION of Commercial Fertilizers.

Plot No.	Treatment Given.	Yield of Oats per Acre, 1912.	
		Grain.	Straw.
		Pounds.	Pounds.
1	Check. No fertilizer	3,720	3,480
2	320 pounds nitrate of soda per acre	3,640	5,160
3	600 pounds superphosphate per acre	3,480	4,920
4	200 pounds muriate of potash per acre	3,920	4,880
5	Check. No fertilizer	3,640	4,360
6	320 pounds nitrate of soda per acre 600 pounds superphosphate per acre 200 pounds muriate of potash per acre	3,720	5,480
7	320 pounds nitrate of soda per acre 600 pounds superphosphate per acre	3,760	4,640
8	320 pounds nitrate of soda per acre 200 pounds muriate of potash per acre	3,600	6,400
9	600 pounds superphosphate per acre 200 pounds muriate of potash per acre	3,640	4,760
10	Check. No fertilizer	3,400	4,600
11	Basic slag, 1000 pounds per acre	3,400	4,200

UNDERDRAINAGE.

These plots produced wheat this year, 1912, following wheat in 1911. They were all ploughed on October 16; sufficient cultivation was given in the spring to put the land in good tilth. The wheat was sown on all plots, on May 11, came up on May 21, headed out on July 4, was ripe on August 27, cut on August 30 and threshed on September 25.

UNDRAINED Land *versus* Land Drained 3 feet and 4 feet deep.

Plot No.	Treatment Given.	Yield of Wheat, per Acre, 1912. Grain.	Straw.
		Pounds.	Pounds.
1	Undrained	2,040	3,960
2	Undrained	2,000	4,800
3	Drain 3 feet deep	1,960	4,040
4	Undrained	2,360	4,440
5	Undrained	2,040	4,360
6	Undrained	2,120	4,280
7	Undrained	2,080	4,320
8	Drain 4 feet deep	2,000	3,600
9	Undrained	2,160	3,840
10	Undrained	2,160	4,240

QUANTITIES OF SEED PER ACRE.

Wheat sown on Wheat Stubble.

The land was fall ploughed, and was harrowed and packed in the spring. The wheat was sown on May 16.

QUANTITIES of Wheat sown on Wheat Stubble.

Quantity of Seed per Acre.	No. of Days Maturing.	Yield of Wheat per Acre, 1912. Bush.	Lb.
2 bushels	102	25	20
1¾ bushels	104	24	00
1½ bushels	104	28	40
1¼ bushels	105	27	20
1 bushel	106	31	20
¾ bushel	108	32	00

Wheat sown on Summer-fallow.

The land was well summer-fallowed, in 1911. The wheat was sown on May 8.

QUANTITIES of Wheat sown on Summer-fallow.

Quantity of Seed per Acre.	No. of Days Maturing.	Yield of Wheat per Acre, 1912. Bush.	Lb.
2 bushels	105	38	00
1¾ bushels	105	37	20
1½ bushels	107	31	20
1¼ bushels	107	31	20
1 bushel	108	28	40
¾ bushel	109	32	00

Oats sown on Oat Stubble.

The land was ploughed in the fall of 1911; it was harrowed and packed in the spring, and sown to oats on May 16. There was a considerable amount of volunteer grain, from the previous crop, which thickened the stand.

OATS sown on Oat Stubble.

Quantity of Seed per Acre.	No. of Days Maturing.	Yield of Oats per Acre, 1912.	
		Bush.	Lb.
4 bushels	116	80	00
3½ bushels	116	89	16
3 bushels	117	85	30
2½ bushels	117	80	00
2 bushels	118	80	40
1½ bushels	118	93	58

Oats sown on Summer-fallow.

The land was well summer-fallowed, in 1911. The oats were sown on May 9.

QUANTITIES of Oats sown on Summer-fallow.

Quantity of Seed per Acre.	No. of Days Maturing.	Yield of Oats per Acre, 1912.	
		Bush.	Lb.
4 bushels	117	125	30
3½ bushels	117	122	12
3 bushels	117	125	30
2½ bushels	117	121	00
2 bushels	118	117	22
1½ bushels	119	116	16

Barley sown on Barley Stubble.

The land was ploughed the preceding fall. It was harrowed and packed in the spring, and the seed sown on May 20. There was a considerable quantity of volunteer grain, from the previous crop, which thickened the stand of grain.

QUANTITIES of Barley sown on Barley Stubble.

Quantity of Seed per Acre.	No. of days Maturing.	Yield of Barley per acre.	
		Bush.	Lb.
3 bushels	95	57	24
2½ bushels	97	60	40
2¼ bushels	97	52	24
2 bushels	97	55	00
1½ bushels	98	54	08
1¼ bushels	101	66	32

Barley sown on Summer-fallow.

The soil was the same as used for wheat and oats. The seed was sown on May 20.

BARLEY sown on Summer-fallow.

Quantity of Seed per Acre.	No. of days Maturing.	Yield of Barley per acre, 1912.	
		Bush.	Lb.
3 bushels	98	82	24
2½ bushels	98	89	08
2 bushels	98	86	32
1½ bushels	99	82	24
1¼ bushels	99	74	08

Flax sown on Summer-fallow.

The land was well summer-fallowed in 1911, and was harrowed before the flax was sown. The flax was sown on June 8.

QUANTITIES of Flax sown on Summer-fallow.

Quantity of Seed per Acre.	No. of days Maturing.	Yield of Flax per acre, 1912.	
		Bush.	Lb.
43 lb.	107	17	08
38 lb.	107	14	36
33 lb.	107	19	16
28 lb.	107	20	00
23 lb.	108	17	08
18 lb.	108	18	32

WEATHER CONDITIONS, 1912.

The season of 1912 was one of extremes. Spring was cold and backward; a heavy snowfall in the middle of April delayed the commencement of seeding, and frequent light showers kept the land unfit for cultivation and made all crops late in being sown. Next followed a period of extreme drought. June was the driest June in the history of the Farm. July went to the other extreme again, with an unusually heavy rainfall. Wet conditions continued until the end of September, and greatly hampered harvesting and threshing, and lowered the quality of the grain crops. October and November were fine and gave a most acceptable opportunity for catching up with the sadly delayed farm operations. The winter season has been about normal, with the usual amount of cold weather and snow.

Some Weather Observations taken at Brandon Experimental Farm, 1912.

Months.	Temperature F.			Precipitation.				Sunshine.
	Highest.	Lowest.	Mean.	Inches Rainfall.	Inches Snowfall.	Total Inches.	Heaviest in 24 Hours.	Total Hours.
	°	°	°					
January	25·9	-45·0	-13·0	....	3·0	·30	1·00	135·1
February	34 0	-27·7	4·6	....	3·0	·30	1·00	91·7
March	41·9	-25·2	15·1	·07	2·0	·27	1·00	201·2
April	71·9	14 0	41 2	·86	7·0	1·56	·70	226·4
May	84·0	21·0	51·5	2·94	....	2·94	·62	185·4
June	101·5	35·0	62·1	·24	....	24	·07	224·9
July	97·8	36·0	63·1	6·46	....	6·46	2·45	166·3
August	82·1	38 4	59·9	1 17	....	1·17	·20	118·1
September	80·2	18·5	49 8	3·46	....	3 46	1·19	132·9
October	75·7	16·0	41·6	·24	....	·24	·21	137·8
November	52·9	5·0	29·2	....	1·0	·10	·10	85·1
December	39·9	-27·2	9·3	....	10·0	1·00	·40	61·1
Total	....	....	....	15·44	26·0	18·04	....	1766·0

EXPERIMENTAL FARM FOR SOUTHERN SASKATCHEWAN, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT, ANGUS MACKAY.

ROTATION OF CROPS.

In 1910 the first of a series of rotations considered more or less suitable for conditions such as obtain in many parts of Saskatchewan was laid down. A fifty-acre field was divided into nine equal areas of 5·55 acres each, and a rotation of nine years' duration commenced. This was followed in 1911 with an eight-year rotation comprised of fields of five acres each, and a three-year rotation in which twenty acres were divided into three equal parts. In the spring of 1912 thirty more acres became available, on which was inaugurated a six-year rotation.

It is proposed to study these carefully over a long period of years, so that in addition to learning something of their relative merits as crop producers and weed destroyers, we may secure information as to their effect on soil fertility. On some of them, roots, corn and legumes have been introduced, the object being to supply foods of a kind suitable for stock-feeding purposes.

It will require the evidence of many years of comparison before we can accept results as being final, but we shall publish our figures from year to year, and make what comment that seems warranted and likely to be of service to our readers.

The following is a description of these rotations, and tables with details regarding the crops grown thereon, this year:—

Rotation 'C.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.

Rotation 'P.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.
Fourth year.—Summer-fallow.
Fifth year.—Roots or legumes. Manured 15 tons per acre.
Sixth year.—Barley. Seeded down with rye grass, red clover and alfalfa.
Seventh year.—Hay.
Eighth year.—Pasture.

Rotation 'R.'

First year.—Summer-fallow.
Second year.—Hoed crops or legumes. Manured 15 tons per acre.
Third year.—Wheat.
Fourth year.—Oats.
Fifth year.—Summer-fallow.
Sixth year.—Wheat.
Seventh year.—Oats. Seeded down with rye grass, red clover and alfalfa.
Eighth year.—Hay.
Ninth year.—Pasture.

The following values have been fixed:—

Return Values.

Wheat (from the machine)	per lb.	1⅓c.
Barley " "	"	1c.
Oats " "	"	1c.
Peas " "	"	1½c.
Flax " "	"	3c.
Timothy hay	per ton.	$10 00
Red clover hay	"	10 00
Alfalfa hay	"	12 00
Brome Grass hay	"	10 00
Western Rye Grass hay	"	10 00
Mixed hay	"	10 00
Green hay	"	10 00
Oat straw	"	2 00
Barley straw	"	2 00
Wheat straw	"	1 00
Pea straw	"	2 00
Flax straw	"	2 00
Dry corn stalks	"	5 00
Corn ensilage	"	3 00
Mangels and turnips	"	3 00
Sugar beets	"	4 00
Pasture, each horse	per month.	1 00
" " cow	"	1 00
" " sheep	"	25

Cost Values.

Rent	per acre.	2 00
Barnyard manure spread on fields (charged equally over all years of the rotation)	per ton.	1 00
Seed wheat	per acre.	1 50
Seed oats	"	1 00
Seed barley	"	1 00

(All other seeds to be charged at actual cost. Cost of grass seed to be charged equally on the years producing grass. Twine charged at actual cost.)

Machinery	per acre.	60
Manual labour	per hour.	19
Horse labour (including teamster)—		
Single horse	per hour.	27
Two-horse team	"	34
Three-horse team	"	41
Four-horse team	"	48
Additional horses	"	7

Work done by traction engine is to be converted into the amount of horse labour required to do the work and charged accordingly.

Threshing (covering work from stook to granary)—		
Wheat	per bush.	7
Oats	"	4
Barley	"	5
Flax	"	12
Peas	"	7

ROTATION

Rotation Year.	Location.	Area.	Crops. 1911.	Crops. 1912.	Items of: Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost of manual labour.
		Acres.	1911.	1912.	$ c.	$ c.	No.	$ c.
C 2...	Lot 1...	6·26	Summer-fallow.. ...	Wheat.....	12 50	20 38	13½	2 56
C 3...	" 2...	6·26	Wheat...	Wheat..	12 50	20 10	9½	1 80
C 1...	" 3...	6·26	Wheat...............	Summer-fallow..	12 50	3 75	....	....
Aggregate...					37 50	44 23	23	4 36
Average per acre in 1912...					....	... .	....	....

ROTATION

Rotation Year.	Location.	Area.	Crops. 1911.	Crops. 1912.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost of manual labour.
P 2...	Lot 1...	6·00	Summer-fallow.......	Wheat..........	23 25	21 20	19	3 61
P 3...	" 2...	6·00	Wheat...............	Wheat.....	23 25	21 00	18	3 42
P 4...	" 3...	6·00	Wheat.....	Summer-fallow..	23 25	3 60	70	13 30
P 5...	" 4...	6·00	Summer-fallow........	Roots.	23 25	12 30	591	112 29
P 6...	" 5...	6·00	Corn..........	Barley...............	23 25	20 00	38½	7 31
P 7...	" 6...	6·00	Barley........	Hay..................	23 25	3 61	28	5 32
P 8...	" 7...	6·00	Seeded..	Pasture..............	23 25	....	....	....
P 1...	" 8...	6·00	Seeded...............	Summer-fallow........	23 25	....	. . ..	....
Aggregate					186 00	81 71	764½	145 25
Average per acre in 1912..........					....	. ..	..	....

ROTATION

Rotation Year.	Location.	Area.	Crops. 1911.	Crops. 1912.	Rent and manure.	Seed, twine and use of machinery.	Hours.	Cost of manual labour.
R 3..	Lot 1...	5·5	Hoed crop....	Wheat.	20 16	19 03	19½	3 70
R 4..	" 2...	5·5	Wheat................	Oats	20 16	16 66	10	1 90
R 5..	" 3...	5·5	Oats	Summer-fallow..... .	20 16	3 30	....	....
R 6.	" 4...	5·5	Summer-fallow..	Wheat...............	20 16	18 81	20	3 80
R 7..	" 5...	5·5	Wheat	Oats.................	20 16	16 79	9½	1 80
R 8..	" 6...	5·5	Oats	Hay	20 16	3 30	22	4 18
R 9.	" 7...	5·5	Hay..	Pasture........	20 16	....	....	....
R 1.	" 8...	5·5	Pasture..............	Summer-fallow........	20 16	3 30	67	12 73
R 2..	" 9...	5·5	Summer-fallow	Corn	20 16	12 10	187	35 53
Aggregate.......					181 44	93 29	335	63 64
Average per acre in 1912.........................					....	....	....	....

"C."

Expense in Raising Crop.										Particulars of Crop.						
Horse labour (including teamster).										Weight in Pounds.						
Hours.																
Single horse.	2-horse team	3-horse team	4-horse team	Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Height of stubble.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre.
No.	No.	No.	No.	$ c.	$ c.	$ c.	$ c.	$ c.	In.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
...	13½	12	...	9 51	10 78	55 73	8 9[illegible]	[illegible] 36	...	9,250	21,450	...	...	134 05	21 41	12 51
...	9½	41½	...	20 24	7 38	62 02	9 9[illegible]	0 59	...	6,330	13,675	...	...	91 23	14 57	4 67
...	..	46½	...	19 06	...	35 31	5 64	...	...	...	...	...	...	...	...	— 5 64
..	23	100	...	48 81	18 16	153 06	24 44	...	...	...	...	...	...	225 28	35 98	11 54
...	...	...	...	...	...	8 15	8 15	...	...	...	...	...	...	11 99	11 99	3 84

"P."

...	17½	20	...	14 15	17 18	79 39	13 23	0 32	6	15,300	27,350	...	...	217 67	36 28	23 05
...	8	22½	...	11 94	11 38	70 99	11 83	0 44	...	9,760	17,460	...	...	138 86	23 14	11 31
...	94	59	...	56 15	...	96 30	16 05	...	...	...	...	...	...	...	...	—16 05
15	91	23	...	44 42	..	192 26	32 04	...	...	...	...	...	420,000	630 00	105 00	72 96
...	14	38½	...	20 54	18 24	89 34	14 89	0 24	...	17,515	32,130	...	...	207 28	34 54	19 65
4	18½	...	...	7 37	...	39 55	6 59	...	...	...	...	10,755	...	53 77	8 96	2 37
...	...	..	...	...	...	23 25	3 87	...	...	...	...	pasture	...	30 00	5 00	1 13
..	8	96	...	42 08	...	65 33	10 89	...	...	...	..	...	...	...	...	—10 89
19	251	259	...	196 65	46 80	656 41	109 39	...	...	...	...	...	...	1,277 58	212 92	103 53
...	...	...	...	...	...	13 67	13 67	...	...	...	...	...	...	26 61	26 61	12 94

"R."

...	9½	42	...	20 45	18 26	81 60	14 83	0 31	6	15,654	31,500	...	...	224 47	40 81	25 98
...	5	34½	...	15 84	11 92	66 48	12 08	0 22	6	10,132	24,200	...	...	125 52	22 82	10 74
...	...	59	...	24 19	...	47 65	8 66	...	...	...	...	...	...	...	...	— 8 66
...	10	46	...	22 26	17 42	82 45	14 99	0 33	6	14,934	26,450	...	...	212 34	38 60	23 61
...	5	33	...	15 23	9 84	63 82	11 60	0 26	6	8,364	17,600	...	...	101 24	18 40	6 80
3½	10	...	...	4 34	...	31 98	5 81	...	...	...	...	4,840	...	24 20	4 40	— 1 41
...	...	..	...	...	...	20 16	3 66	...	...	...	...	...	...	33 00	6 00	2 34
...	77	70	...	54 88	...	91 07	16 55	...	...	...	...	...	...	...	...	—16 55
...	52	28	...	29 16	...	96 94	17 63	...	...	...	...	...	254,000	381 00	69 27	51 64
3½	168½	312½	...	186 35	57 44	582 16	105 81	...	...	...	...	...	...	1,101 77	200 30	94 49
...	...	...	...	...	...	11 76	11 76	...	...	...	...	...	...	22 26	22 26	10 50

CULTURAL EXPERIMENTS.

In the spring of 1911 our work on soil and crop management was greatly extended. In addition to the inception of rotation tests a comprehensive set of experiments was inaugurated with a view to determining methods of cultivation likely to prove best, within a specified rotation. This work involves 478 plots, each one-fortieth of an acre in extent. Considerable preparatory work was necessary, and even now certain of them have not reached the point where results of value are being obtained. The following brief outline will indicate the object and nature of this work:—

Experiment 2A—Depth of ploughing wheat stubble to be sown to oats.
" 2B—Depth of ploughing summer-fallow to be sown to wheat, followed by oats.
" 2C—Depth of ploughing sod to be sown to wheat, followed by oats.
" 3—Summer-fallow treatment previous to sowing wheat.
" 4A—Treatment of wheat stubble to be sown to wheat.
" 4B—Treatment of wheat stubble to be sown to oats.
" 5—Seeding to grass and clover.
" 6—Breaking sod from cultivated grasses and clovers.
" 7A—Applying barnyard manure for corn or roots.
" 7B—Applying barnyard manure for wheat.
" 7C—Applying barnyard manure for barley.
" 7D—Applying barnyard manure for oats.
" 8—Green manuring.
" 9—Seed-bed preparation.
" 10A—Soil packing for wheat sown on summer-fallow.
" 10B—Soil packing for wheat sown on spring-ploughed wheat stubble.
" 10C—Soil packing for wheat sown on fall ploughed stubble land.
" 11—Depth of seeding.
" 12—Commercial fertilizers.
" 13—Underdraining.

DEPTH OF PLOUGHING.

Depth of Ploughing Wheat Stubble to be sown to Oats.

Plot.	Depth of Ploughing Wheat Stubble, Fall of 1911.	Date of Sowing.	Date of Coming Up.	Date of Heading.	Date of Ripening.	Days to Mature.	Yield of Oats per Acre, 1912. Grain.	Straw.
							Pounds.	Pounds.
1	Ploughed 3 inches deep..	May 13.	May 26.	July 22.	Sept. 6.	116	2,760	2,840
2	" 4 "	" 13.	" 26.	" 22.	" 6.	116	2,920	2,400
3	" 5 "	" 13.	" 26.	" 22.	" 6	116	2,720	2,360
4	" 5 "	" 13.	" 26.	" 22	" 6.	116	2,800	2,320
5	" 5 "	" 13.	" 26.	" 22	" 6.	116	2,640	2,520
6	" 5 "	" 13.	" 26.	" 22	" 6.	116	3,160	4,000
7	" 5 "	" 13.	" 26.	" 22.	" 6.	116	3,280	4,680
8	" 5 "	" 13.	" 26.	" 22.	" 6.	116	3,440	3,680
9	" 5 "	" 13.	" 26.	" 22.	" 6.	116	3,560	3,520
10	" 5 "	" 13.	" 26.	" 22.	" 6.	116	3,840	4,960

DEPTH of Ploughing Summer-fallow to be sown to Wheat.

Plot.	Depth of Ploughing Summer-fallow, 1911.	Date of Sowing.	Date of Coming Up.	Date of Heading.	Date of Ripening.	Days to Mature	Yield of Wheat per Acre, 1912.	
							Grain.	Straw.
							Pounds.	Pounds.
1	Ploughing 3 inches deep	Apr. 11.	May 10.	July 5.	Aug. 19.	130	2,480	4,360
2	" 4 "	" 11.	" 10.	" 5.	" 19.	130	2,920	2,800
3	" 5 "	" 11.	" 10	" 5.	" 19.	130	2,960	3,760
4	" 6 "	" 11.	" 10.	" 5.	" 19.	130	2,640	4,360
5	" 7 "	" 11.	" 10.	" 5.	" 16.	127	3,000	4,680
6	" 8 "	" 11	" 10	" 5.	" 16.	127	3,160	4,040
7	Ploughing 5 inches deep and subsoiling 4 inches..................	" 11.	" 10.	" 5.	" 19.	130	3,440	4,520
8	Ploughing 6 inches deep and subsoiling 4 inches..................	" 11.	" 10.	" 5.	" 20.	131	3,040	5,960
9	Ploughing 7 inches deep and subsoiling 4 inches	" 11.	" 10.	" 5.	" 20.	131	3,000	6,520
10	Ploughing 8 inches deep and subsoiling 4 inches	" 11.	" 10.	" 5.	" 20.	131	3,280	5,360

DEPTH of Ploughing Sod to be sown to Wheat.

Plot.	Depth of Plouging Sod, 1911.	Date of Sowing.	Date of Coming Up.	Date of Heading.	Date of Ripening.	Days to Mature.	Yield of Wheat per Acre, 1912.	
							Grain.	Straw.
							Pounds.	Pounds.
1	Ploughed 3 inches deep	Apr. 15.	May 14.	July 16.	Aug. 19.	126	1,780	3,260
2	" 4 "	" 15.	" 14.	" 16.	" 19.	126	1,500	2,300
3	" 5 "	" 15.	" 14.	" 16.	" 19.	126	1,900	2,060
4	" 3 "	" 15.	" 14.	" 16.	" 19.	126	1,780	3,260

SUMMER-FALLOW TREATMENT.

TREATMENT of Summer-fallow to be sown to Wheat, followed by Oats.

Plot.	Treatment of summer-fallow 1911.	Date of seeding.	Date of coming up.	Date of heading	Date of Ripening.	Days to mature.	Yield of Wheat per acre 1912. Grain.	Straw.
							Lb.	Lb.
1	Plough 4 inches June, pack if necessary and practicable, cultivate as necessary....	April 11	May 12	June 29	Aug. 15	126	3,400	4,160
2	Plough 6 inches June, pack if necessary and practicable, cultivate as necessary.. .	" 11	" 12	" 29	" 15	126	3,480	6,120
3	Plough 8 inches June, pack if necessary and practicable, cultivate as necessary	" 11	" 12	" 29	" 15	126	3,440	5,360
4	Plough 4 inches June, cultivate. Plough 4 inches September, harrow	" 11	" 12	" 29	" 15	126	3,200	5,200
5	Plough 6 inches June, cultivate. Plough 6 inches September, harrow	" 11	" 12	July 1	" 18	129	3,040	5,020
6	Plough 8 inches June, cultivate. Plough 8 inches September, harrow..	" 11	" 12	" 1	" 18	129	3,240	4,560
7	Plough 6 inches June, cultivate. Plough 4 inches September, harrow.	" 11	" 12	" 1	" 18	129	3,080	4,280
8	Plough 4 inches June, cultivate. Plough 6 inches September, harrow	" 11	" 12	" 1	" 18	129	2,520	3,920
9	Plough 4 inches June early as possible, cultivate Plough 6 inches September, leave untouched....	" 11	" 12	" 1	" 18	129	2,520	1,760
10	Plough 5 inches June, seed to rape or other forage crop and pasture off....	" 11	" 12	" 1	" 18	129	2,800	4,920
11	Plough 6 inches May 15, harrow and pack if necessary, cultivate as necessary........	" 11	" 12	" 1	" 18	129	3,080	3,960
12	Plough 6 inches June 15, harrow and pack if necessary, cultivate as necessary..........	" 11	" 12	" 1	" 19	130	3,160	3,740
13	Plough 6 inches July 15, harrow and pack if necessary, cultivate as necessary...	" 11	" 12	" 1	" 19	130	3,280	5,480
14	Fall cultivate before summer-fallowing. Plough 6 inches June, harrow and pack if necessary, cultivate as necessary..........	" 11	" 12	" 1	" 20	131	3,240	5,160
15	Fall plough 4 inches bef re summer-fallowing. Plough 6 inches June, harrow and pack if necessary, cultivate as necessary...	" 11	" 12	" 1	" 20	131	3,000	4,000
16	Plough 6 inches June, pack, cultivate as necessary........................	" 11	" 12	" 1	" 20	131	3,080	5,000
17	Plough 6 inches June, no packing, otherwise same as other plots................	" 11	" 12	" 1	" 20	131	3,120	4,880

STUBBLE TREATMENT.

TREATMENT of Wheat Stubble to be sown to Wheat.

Plot No.	Treatment given Wheat Stubble preceding Wheat.	Date of Sowing	Date of Coming-up.	Date of Heading.	Date of Ripening.	Days to Mature.	Yield of Wheat per Acre, 1912. Grain.	Straw.
							Pounds.	Pounds.
1	Plough, autumn....................	April 15	May 12	July 6	Aug. 10	117	1,020	1,220
2	Disc harrow, autumn	" 15	" 12	" 6	" 10	117	1,780	2,380
3	Burn stubble, then disc, autumn.....	" 15	" 12	" 6	" 10	117	1,300	1,260
4	Burn stubble, then plough, autumn ..	" 15	" 12	" 6	" 10	117	1,140	1,380
5	Burn stubble in spring, seed at once..	" 15	" 12	" 6	" 10	117	1,540	1,660
6	Plough in spring, seed at once..	" 15	" 12	" 6	" 10	117	1,860	1,740
7	Disc at cutting time, spring plough..	" 15	" 12	" 6	" 10	117	1,940	1,260
8	Disc at cutting time, autumn plough.	" 15	" 12	" 6	" 10	117	1,780	1,920
9	Plough aut'n., subsurface pack at once.	" 15	" 12	" 6	" 10	117	2,180	1,300
10	Plough spring, seed, subsurface pack.	" 15	" 12	" 6	" 10	117	1,540	1,260

TREATMENT of Wheat Stubble to be sown to Oats.

Plot No.	Treatment given Wheat Stubble preceding Oats.	Date of Sowing.	Date of Coming-up.	Date of Heading.	Date of Ripening.	Days to Mature.	Yield of Oats per Acre, 1912. Grain.	Straw.
							Pounds.	Pounds.
11	Plough autumn, subsurf. pack at once.	May 13	May 23	July 23	Aug. 30	109	2,120	2,820
12	Plough spring, seed, subsurface pack.	" 13	" 23	" 23	" 30	109	2,240	1,840
13	Cultivate autumn, spring plough, seed.	" 13	" 23	" 23	" 30	109	2,240	2,800

GREEN MANURING.

GREEN Manuring for Wheat followed by Oats.

Plot Number.	Treatment of Land year previous to Wheat.	Date of sowing.	Date of coming up.	Date of heading.	Date of ripening.	Days to mature.	Yield of Wheat per Acre, 1912. Grain	Straw	Yield of Oats per Acre following Wheat grown, 1911. Grain	Straw
							Lb.	Lb.	Lb.	Lb.
1	Summer-fallow.......	Apr. 11	May 13	July 8	Aug. 19	130	2,360	5,440	2,240	3,840
2	Peas, ploughed under early July..	" 11	" 13	" 8	" 19	130	2,840	3,520	2,200	3,000
3	Peas, ploughed under when in blossom..	" 11	" 13	" 8	" 19	130	2,360	3,880	2,080	2,480
4	Tares, ploughed under late July..	" 11	" 13	" 8	" 19	130	2,840	3,240	2,200	3,520
5	Summer-fallow, barnyard manure, 12 tons per acre applied on summer-fallow in September..	" 11	" 13	" 8	" 19	130	2,440	4,860	2,360	2,560
6	Summer-fallow.....	" 11	" 13	" 8	" 19	130	3,000	2,720	2,400	2,700

SEED BED—PREPARATION.

Preparation of Seed Bed for Wheat following Summer-fallow.

Plot Number.	Treatment given.	Date of sowing.	Date of coming up.	Date of heading.	Date of ripening.	Days to mature.	Yield of Wheat per acre, 1912.	
							Grain.	Straw.
							Lb.	Lb.
1	Poor preparation..........	Apr. 11..	May 13..	July 5..	Aug. 19..	130	3,000	4,560
2	Good preparation.........	" 11..	" 13..	" 5..	" 19..	130	2,920	3,600
3	Extraordinary preparation.	" 11..	" 13..	" 5..	" 19..	130	2,920	4,280

Preparation of Seed Bed for Oats following Wheat.

Plot Number.	Treatment given.	Date of sowing.	Date of coming up.	Date of headiag.	Date of ripening:	Days to mature.	Yield of Oats per acre, 1912.	
							Grain.	Straw.
							Lb.	Lb.
1	Poor preparation..........	May 13..	May 23..	July 24..	Aug. 31..	110	2,640	4,000
2	Good preparation.....	" 13..	" 23..	" 24..	" 31..	110	2,960	4,600
3	Extraordinary preparation.	" 13..	" 23..	" 24..	" 31..	110	3,920	3,280

SOIL PACKERS.

Soil Packing in Preparation for Wheat following Summer-fallow.

Plot No.	Cultural Treatment Given.	Date of sowing.	Date of coming up.	Date of heading	Date of ripening	Days to mature.	Yield of Wheat per acre, 1912. Grain.	Straw.
		April.	May.	July.	August.	Days.	Lb.	Lb.
1	Harrow, seed	15	15	7	17	124	2,140	2,260
2	Harrow, seed, surface pack	15	15	7	17	124	2,340	3,900
3	Harrow, seed, surface pack, harrow	15	15	7	17	124	2,740	2,540
4	Harrow, seed, subsurface pack	15	15	7	17	124	2,140	1,260
5	Harrow, seed, subsurface pack, harrow.	15	15	7	15	122	2,660	1,540
6	Harrow, seed, combination pack	15	15	7	17	124	2,780	2,020
7	Harrow, seed, combination pack, harrow	15	15	7	17	124	1,940	2,460
8	Surface pack, seed, surface pack	15	15	7	17	124	1,820	1,420
9	Subsurface pack, seed, subsurface pack.	15	15	7	17	124	2,300	2,540
10	Combination pack, seed, combination pack	15	15	7	17	124	1,980	2,020
11	Surface pack, harrow, seed	15	15	7	17	124	1,220	1,340
12	Subsurface pack, harrow, seed	15	15	7	17	124	1,620	1,460
13	Combination pack, harrow, seed	15	15	7	17	124	1,580	2,380
14	Harrow, seed	12	15	7	17	127	1,020	1,220
15	Plough for summer-fallow, surface pack, cultivate the next spring, smoothing harrow, seed	12	15	7	15	125	1,220	1,980
16	Plough for summer-fallow, subsurface pack, cultivate the next spring, smoothing harrow, seed	12	15	7	15	125	2,060	2,620
17	Plough for summer-fallow, combination pack, cultivate the next spring, smoothing harrow, seed	12	15	7	17	127	1,260	1,840
18	Plough for summer-fallow, surface pack, cultivate the next spring, smoothing harrow, seed, surface pack.	12	15	7	17	127	1,140	1,740
19	Plough for summer-fallow, subsurface pack, cultivate the next spring, smoothing harrow, seed, subsurface pack	12	15	7	17	127	1,560	2,440
20	Plough for summer-fallow, combination pack, cultivate the next spring, smoothing harrow, seed, combination pack	12	15	7	17	127	2,220	1,860
21	Harrow, seed	12	15	7	17	127	1,780	2,620
22	Harrow, seed, harrow when 6 inches high	12	15	7	17	127	1,660	1,540
23	Harrow, seed, surface pack when 6 inches high	12	15	7	17	127	1,580	2,900
24	Harrow, seed, roll when 6 inches high	12	15	7	17	127	1,180	1,380
25	Harrow, seed	12	15	7	17	127	1,180	1,700

DEPTHS OF SEEDING.

Depths of Seeding Wheat.

Plot No.	Depths Sown.	Date of sowing.	Date of coming up.	Date of heading.	Date of ripening	Days to mature.	Yield of Wheat per acre, 1912. Grain.	Straw.
		April.	May.	June.	Aug.		Lb.	Lb.
1	Sowing 1 inch deep	11	13	7	5	116	2,600	3,400
2	" 2 inches "	11	13	7	19	130	2,840	3,600
3	" 3 " "	11	15	5	19	130	2,720	4,680
4	" 4 " "	11	15	5	19	130	2,880	3,840

DEPTHS of Seeding Oats.

Plot No.	Depths Sown.	Date of sowing.	Date of coming up.	Date of heading	Date of ripening	Days to mature.	Yield of Oats per acre, 1912. Grain.	Straw.
		May.	May.	July.	Sept.		Lb.	Lb.
1	Sowing 1 inch deep..................	13	25	20	4	114	2,840	2,080
2	" 2 inches "	13	27	20	4	114	2,720	3,360
3	" 3 " "	13	27	20	4	114	3,160	3,280
4	" 4 " "	13	27	20	4	114	3,640	3,360

COMMERCIAL FERTILIZER.

The plots for this experiment grew wheat in 1911, and the fertilizers were applied when the wheat was sown. This year they grew oats.

APPLICATION of Commercial Fertilizers.

Plot No.	Treatment Given.	Date of sowing.	Date of coming up.	Date of heading.	Date of ripening	Days to mature.	Yield of Oats per acre, 1912. Grain.	Straw.
		May	May.	July.	Sept.		Lb.	Lb.
1	Check. No Fertilizer..............	13	27	22	2	112	3,600	5,600
2	320 pounds nitrate of soda per acre.....	13	27	22	2	112	3,760	3,800
3	600 pounds superphosphate per acre....	13	27	22	2	112	3,600	4,800
4	200 pounds muriate of potash per acre..	13	27	22	2	112	3,680	3,360
5	Check. No Fertilizer..............	13	27	22	2	112	3,680	3,680
6	320 pounds nitrate of soda, 600 pounds superphosphate, 200 pounds muriate of potash, per acre	13	27	22	2	112	3,800	5,040
7	320 pounds nitrate of soda, 600 pounds superphosphate, per acre	13	27	22	2	112	3,040	3,400
8	320 pounds nitrate of soda, 200 pounds muriate of potash, per acre..........	13	27	22	2	112	3,280	4,320
9	600 pounds superphosphate, 200 pounds muriate of potash, per acre..........	13	27	22	2	112	3,920	2,680
10	Check. No Fertilizer................	13	27	22	2	112	3,760	4,400
11	Basic Slag, 1,000 pounds per acre.......	13	27	22	2	112	3,200	4,000
12	Clover in place of grass	13	27	22	2	112	3,280	2,840
13	Clover in place of grass	13	27	22	2	112	2,880	2,200
14	Barnyard manure, 16 tons applied once in 4 years	13	27	22	2	112	2,400	2,760
15	Barnyard manure, 8 tons applied once in 4 years	13	27	22	2	112	2,320	3,560
16	Check. No Fertilizer.................	13	27	22	2	112	3,160	4,440

UNDERDRAINAGE.

UNDRAINED Land *versus* Land Drained three feet and four feet deep.

Plot No.	Treatment Given.	Date of Sowing.	Date of Coming Up.	Date of Heading.	Date of Ripening.	Days to Mature.	Yield of Wheat per Acre, 1912.	
							Grain.	Straw.
		April.	May.	July.	Aug.		Lb.	Lb.
1	No drainage	11	14	6	19	130	1,860	3,180
2	"	11	14	6	19	130	1,820	1,100
3	Drained 3 feet deep	11	14	6	19	130	2,860	2,740
4	No drainage	11	14	6	19	130	2,820	3,900
5	"	11	14	6	19	130	2,780	1,740
6	"	11	14	6	19	130	2,460	2,820
7	Drained 4 feet deep	11	14	6	19	130	2,260	2,540
8	No drainage	11	14	6	19	130	1,940	2,260
9	"	11	14	6	19	130	1,820	1,220

FIELD CROP YIELDS.

SPRING WHEAT.

YIELDS of Spring Wheat following Different Crops.

Variety.	Previous Treatment.	Area.	Yield per Acre.		Total Yield.	
		Acres.	Bush.	Lb.	Bush.	Lb.
Red Fife	Root land	5·50	46	48	257	24
Red Fife	Fallow	5·50	45	16	248	58
Red Fife	Fallow	6·00	42	35	255	30
Red Fife	Stubble	5·80	28	..	161	..
Red Fife	Fallow	6·25	24	40	154	10
Red Fife	Fallow	3 00	39	3	117	9
Red Fife	Stubble	6·25	16	53	105	31
Marquis	Fallow	10·00	43	.	430	..
Marquis	Fallow	10·00	48	40	486	40
Marquis	Stubble	10·80	16	4	173	20
Marquis, (Special Registered)	Fallow	2·00	47	6	94	12
Prelude	Fallow	1·10	42	18	46	35
363 "E" (Variety not named)	Fallow	1·15	54	26	58	10
		73 35	...		2,588	39

Average yield per acre: 35 bushels 17 pounds.

OATS.

Yields of Oats, following Different Crops.

Variety.	Previous Treatment.	Area.	Yield per Acre.		Total Yield.	
		Acres.	Bush.	Lb.	Bush.	Lb.
Banner	Fallow	9	101	26	916	—
"	Stubble	5·67	52	21	327	16
"	"	5·24	46	32	245	28
"	Pea land	8·35	53	22	447	32
Abundance	Fallow	22·92	77	4	1,767	26
"	"	3·67	95	15	350	10
Ligowo, Swedish	"	2·22	108	20	241	3
		57·07			4,296	13

Average yield per acre: 75 bushels 9 pounds.

BARLEY.

Yields of Barley following Different Crops.

Variety.	Previous Treatment.	Area.	Yield per acre.		Total yield.	
		Acres.	Bush.	Lb.	Bush.	Lb.
Mensury	Fallow	10.50	36	6	379	15
O.A.C., No. 21	Fallow	2.50	32	38	81	47
Canadian Thorpe	Fallow	2.44	55	40	136	11
Hannchen	Fallow	2.42	57	..	137	45
Manchurian	Fallow	8.16	73	28	600	21
Manchurian	Back setting	5.29	58	33	310	21
Manchurian	Root land	6.13	59	25	364	41
		37.44			2,011	9

Average yield per acre : 53 bushels 35 pounds.

PEAS.

Two varieties were sown in field lots on fallowed land, at the rate of two bushels of Golden Vine and three bushels of Arthur per acre. Both were sown on April 19. Golden Vine was ripe on September 10; Arthur was ripe on September 5. They yielded as follows:—

Arthur.................. 36 bushels 51 pounds per acre.
Golden Vine............. 50 bushels 49 pounds per acre.

FLAX.

Premost flax was sown on fallowed and on potato land at the rate of 40 pounds per acre. That sown on fallow, on May 28, was ripe on September 10. That sown on potato land, on May 15, was ripe on September 2. Yields were as follows:—

Premost, on fallowed land....... 17 bushels 9 pounds per acre.
Premost, on root land.......... 14 bushels 29 pounds per acre.

SOME Weather Observations taken at Indian Head Experimental Farm, 1912.

Month.	Temperature F.			Precipitation.				Total Sunshine.
	Mean.	Highest.	Lowest.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January........	— 8·06	30	—47	....	3·45	0·345	....	68 8
February......	7·41	35	—26	....	1·50	0·15	....	101·9
March..........	6·93	42	—28	....	4·00	0·40	....	156·4
April..........	40·60	78	12	0·40	3·00	0·70	0·16	194·5
May............	49·45	81	22	3·66	....	3·66	1·39	155·8
June............	61·63	97	34	1·42	....	1·42	0·35	278·5
July............	60 29	90	39	3·42	....	3·42	0·76	141·2
August........	59·71	80	39	2·17	....	2·17	0·53	130 3
September......	46·23	74	22	1·98	....	1·98	0·75	117·8
October.........	39·93	80	20	0·25	1·00	0·35	0·15	113·8
November......	29·40	61	8	....	3·50	0·35	....	84·3
December......	13 19	39	—19	....	12·25	1·225	6·00	53·2
Total......	....	....	....	13·30	28 70	16·17	....	1,596·5

EXPERIMENTAL STATION FOR CENTRAL SASKATCHEWAN, ROSTHERN, SASK.

REPORT OF THE SUPERINTENDENT, WM. A. MUNRO, B.A., B.S.A.

WEATHER CONDITIONS, 1912.

The season opened under normal and favourable conditions, and seeding was begun on April 10, and all crops made good growth until early in June, when dry weather set in and crops that had not a goodly supply of soil moisture suffered greatly, and even those under the most favourable conditions suffered to a very large extent.

Showery weather prevailed until nearly the middle of May and hay crops especially were very promising, but with the continued dry weather until late in June the meadows of two years' standing, or longer, became yellow and did not fully revive again all summer. In the months of July, August and September, there was more than average precipitation, which had a peculiar effect upon the grain crops. The plants had adapted themselves to the dry weather conditions of June by growing very little, and with the heavy rains in July the plants developed, and at harvest time there was the peculiar circumstance of several stages of development in the plants of one plot, and in many cases in the heads of grain of one plant. Some of the wheat was ripe while other heads in the same plant were in blossom. This condition of irregular growth worked to the disadvantage of the farmer at every stage. In the first place there was no means of determining the best time to cut; after cutting, the green straw delayed the drying of the grain; at threshing a great deal of the undeveloped grain blew out with the straw which very materially lowered the yield as compared with the yield promised from the stand, and, at marketing, the immature grain with the good grain lowered the grade.

Another unfavourable weather condition of 1912 was the unusually high precipitation in August, September and October. The continued wet weather in the latter part of July and August delayed the ripening of the grain, and then the wet weather of September and October prevented drying, and in many cases caused sprouting in the shocks.

The redeeming feature was the delay of very cold weather until December which made it possible to continue threshing throughout the month of November.

Following are the meteorological records for the past year:—

SOME Weather Observations taken at Rosthern Experimental Station, 1912.

Month.	Temperature F.			Precipitation.				Total Sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January........	34·4	—54·1	12·52	....	3	0.3	0·2	101·6
February.....	39·3	—27·8	5·5	......	3	0·3	0·2	115·7
March.........	40·4	—30·0	4·09	....	6	0·6	0 6	222·7
April	63·0	16·8	39·21	0·67	....	0·67	0·36	251·4
May........	84·2	28·2	48·5	2·20	....	2·20	0·71	246·7
June...........	93·8	34·0	61·88	2·81	....	2·81	0 97	363·7
July............	76·2	38·2	57·7	5·25	....	5·25	1·26	164·9
August.........	79·2	37·2	58·6	2·15	....	2·15	0·55	192·2
September......	73·2	20·6	45·74	2·66	1	2·76	1·24	133·0
October.........	67·7	17·7	38·48	0·22	....	0·22	0·15	107·4
November	41·0	0·0	23·99	0·37	4·5	0·82	0·45	64·2
December	38·8	—23·2	8·15	....	5	0·5	0·3	62·4
Total......	......	....	....	16·33	22·5	18 58	....	2,025·9

ROTATION OF CROPS.

Records of costs of operations and values of products were kept for four different rotations varying in duration from three to nine years.

Rotation 'C.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat or coarse grain.

Rotation 'J.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat or coarse grain.
Fourth year.—Oats. Seeded down with rye grass, red clover and alfalfa.
Fifth year.—Hay.
Sixth year.—Pasture.

Rotation 'P.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.
Fourth year.—Summer-fallow.
Fifth year.—Hoed crops or legumes.
Sixth year.—Barley. Seeded down with rye grass, red clover and alfalfa.
Seventh year.—Hay.
Eighth year.—Pasture.

Rotation 'R.'

First year.—Summer-fallow.
Second year.—Hoed crop or legumes. Manured 15 tons per acre.
Third year.—Wheat.
Fourth year.—Oats.
Fifth year.—Summer-fallow.
Sixth year.—Wheat.
Seventh year.—Oats. Seeded down with rye grass, red clover and alfalfa.
Eighth year.—Hay.
Ninth year.—Pasture.

The following schedule shows the valuations that have been fixed for computing the results of these rotation experiments:—

Return Values.

Wheat (from the machine)	per lb.	$1\frac{1}{3}$c.
Barley " "	"	1c.
Oats " "	"	1c.
Peas " "	"	$1\frac{1}{2}$c.
Flax " "	"	3c.
Timothy hay	per ton.	$10 00
Red Clover hay	"	10 00
Alfalfa hay	"	12 00
Brome Grass hay	"	10 00
Western Rye Grass hay	"	10 00

Mixed hay	per ton.	$10 00
Green hay	"	10 00
Oat straw	"	2 00
Barley straw	"	2 00
Wheat straw	"	1 00
Pea straw	"	2 00
Flax straw	"	2 00
Dry corn stalks	"	5 00
Corn ensilage	"	3 00
Mangels and turnips	"	3 00
Sugar beets	"	4 00
Pasture, each horse	per month.	1 00
" " cow	"	1 00
" " sheep	"	25

Cost Values.

Rent	per acre.	$2 00
Barnyard manure spread on fields (charged equally over all years of the rotation)	per ton.	1 00
Seed wheat	per acre.	1 50
Seed oats	"	1 00
Seed barley	"	1 00
(All other seeds to be charged at actual cost. Cost of grass seed to be charged equally on the years producing grass. Twine charged at actual cost.)		
Machinery	per acre.	60
Manual labour	per hour	19
Horse labour (including teamster)—		
Single horse	per hour.	27
Two-horse team	"	34
Three-horse team	"	41
Four-horse team	"	48
Additional horses	"	7
Work to be done by traction engine is to be converted into the amount of horse labour required to do the work and charged accordingly.		
Threshing (covering work from stook to granary)—		
Wheat	per bush.	7
Oats	"	4
Barley	"	5
Flax	"	12
Peas	"	7

ROTATION

Rotation Year.	Location.	Area.	Crops.		Items of Expense						
					Rent and Manure.	Seed, Twine and use of Machinery.	Manual Labour.		Horse Labour (in Hours.		
							Hours.	Cost.	Single horse.	2-Horse Team.	3-Horse Team.
		Acres.	1911.	1912.	$ c.	$ c	No.	$ c.	No.	No.	No.
C 3..	Lot 1...	2	Summer-fallow	Wheat	4 00	5 35	2½	0 47	....	3	5½
C 1..	" 2...	2	Wheat	Summer-fallow	4 00	1 20	.... .	....	....	4½	11½
C 2..	" 3...	2	Wheat	Wheat..	4 00	5 51	4	0 76	....	3	6
Aggregate ...					12 00	12 06	6½	1 23	...	10½	23
Average per acre in 1912					2 00	2 01	....	0 20	...	......	....-...

ROTATION

J 2...	Lot 1...	2	Summer-fallow	Wheat	4 00	5 75	4	0 76	....	3	6
J 3...	" 2...	2	Wheat	Wheat	4 00	5 35	2	0 38	....	3	8
J 4..	" 3...	2	Wheat........	Oats........ ..	4 00	8 62	5½	1 04	....	3	4½
J 5...	" 4...	2	Oats	Hay..........	4 00	3 48	1½	0 28	...	1	1
J 6. .	" 5...	2	Hay	Hay..........	4 00	1 20	2	0 38	..	.....	6½
J 1...	" 6...	2	Oats	Summer-fallow	4 00	1 20	....	....	....	3¾	12¼
Aggregate ...					24 00	25 60	15	2 8	....	13¾	38¼
Average per acre, 1912					2 00	2 13	....	0 2	.	......	....

ROTATION

									....	3	6½
P 2...	Lot 1...	2	Summer-fallow	Wheat	7 00	5 59	4	0 76	....	3	7¾
P 3...	" 2...	2	Wheat	Wheat	7 00	5 51	3	0 57	....	3¾	6½
P 4...	" 3...	2	Wheat	Summer-fallow	7 00	1 20	....	....	10	2½	....
P 5...	" 4..	2	Summer-fallow	Roots	7 00	6 84	186½	35 43	....	3	3
P 6...	" 5...	2	Roots.........	Barley........	7 00	8 28	9½	1 80	....	1	4
P 7..	" 6...	2	Barley........	Hay..........	7 00	3 48	1½	0 28	1	2	4½
P 8...	" 7...	2	Hay....... ..	Hay	7 00	1 20	....	....	....	3	11¾
P 1..	" 8...	2	Hay	Summer-fallow	7 00	1 20	....	....			
									11	21¼	44
Aggregate....					56 00	33 30	204½	38 84			
Average per acre in 1912					3 50	2 08	......	2 43	....	......	....

ROTATION

R 2...	Lot 1...	2	Summer-fallow	Corn....... ..	6 66	5 72	58	11 02	5	4¼	.. ..
R 3...	" 2...	2	Hoed crop.....	Wheat	6 66	5 59	12¾	2 42	....	3	5¾
R 4...	" 3...	2	Wheat	Oats	6 66	6 26	6	1 14	....	3	8¾
R 5...	" 4...	2	Oats...........	Summer-fallow	6 66	1 20	....	....	....	3¾	14¼
R 6...	" 5...	2	Summer-fallow	Wheat	6 66	5 75	4	0 76	....	3	6
R 7...	" 6...	2	Wheat..... ..	Oats...........	6 66	7 98	5½	1 04	....	3	7
R 8...	" 7...	2	Oats	Hay.	6 66	3 80	1½	0 28	....	2	4
R 9-..	" 8...	2	Hay	Hay.	6 66	1 20	9	1 71	2	4	4½
R 1-..	" 9...	2	Hay	Summer-fallow	6 66	1 20	....	....	....	3½	18¼
Aggregate....					59 94	38 70	96¾	18 37	7	29½	68½
Average per acre 1912					3 33	2 15	....	1 02	....	....	....

'C.'

in Raising Crop.							Particulars of Crop.						
cluding Teamster).							Weight in Pounds.						
4-Horse Team.	Value of Horse Labour.	Cost of Threshing.	Total Cost.	Cost for 1 Acre.	Cost for 1 Bushel.	Height of Stubble.	Grain.	Straw.	Hay.	Roots and Ensilage.	Total Value.	Value of Crop per Acre.	Profit per Acre.
No.	$ c.	$ c.	$ c.	$ c.	$ c.	In.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
3	4 71	2 17	16 70	8 35	0 54	8	1,873	8,064	.....	....	29 00	14 50	6 15
2	7 20	.....	12 40	6 20	.....	.....	.....	..	.....	....	....	....	– 6 20
2	4 44	3 15	17 86	8 93	0 39	8	2,727	9,892	.....	....	41 28	20 64	11 71
7	16 35	5 32	46 96	23 48	......	......	.....	...	....	....	70 28	35 14	11 66
.....	2 72	0 89	7 82	7 82	.....	.....	......	.....	.....	....	11 71	11 71	3 89
"J."													
2	4 44	3 43	18 38	9 19	0 37	8	2,939	7,272	.....	....	42 81	21 40	12 21
3	5 74	2 10	17 57	8 78	0 58	8	1,810	8,568	.....	....	28 41	14 20	5 42
2	3 82	4 12	21 60	10 80	0 21	8	3,605	9,510	......	....	44 55	22 27	11 47
1	1 23	...	8 99	4 48	....	......	......	......	......	....	....	....	– 4 48
1	3 14	......	8 72	4 36	......	....	......	...	7,725	....	38 62	19 31	14 95
2	7 25	.....	12 45	6 22	.....	.....	......	......	......	....	....	....	– 6 22
11	25 62	9 65	87 71	43 83	...	.....	......	...	......	....	154 39	77 18	33 35
......	2 13	0 80	7 30	7 30	......	......	......	....	......	....	12 86	12 86	5 56
'P'													
1	4 16	4 86	22 37	11 18	0 32	8	4,174	12,330	....	......	61 81	30 90	19 72
3	5 64	2 24	20 96	10 48	0 65	8	1,920	7,392	....	....	29 20	14 60	4 12
3	5 37	......	13 57	6 78	......	......	......	......	....	....	....	....	— 6 78
......	3 55	......	52 82	26 41	......	......	......	..	.....	69,403	104 10	52 05	25 64
1	2 73	4 55	24 36	12 18	0 27	8	4,395	9,169	....	....	53 12	26 56	14 38
1	2 46	.....	13 22	6 61	....	......	......	......	....	....	....	....	— 6 61
1	3 27	......	11 47	5 73	......	......	.....	......	9,535	....	47 67	23 83	18 10
2	6 49	.....	14 69	7 34	.....	......	......	......	....	....	......	.....	— 7 34
12	33 67	11 65	173 46	86 71	......	......	......	......	....	......	295 90	147 94	61 23
......	2 10	0 73	10 84	10 84	......	......	......	......	....	....	18 49	18 49	7 65
'R'													
......	3 51	......	26 91	13 45	.....	....	......	.....	....	60,950	91 50	45 75	32 30
2	4 34	4 62	23 63	11 81	0 36	8	3,961	13,565	....	....	59 56	29 78	17 97
2	5 56	6 29	25 91	12 95	0 16	8	5,361	12,420	....	....	66 03	33 01	20 06
1	7 59	..	15 45	7 72	......	......	......	......	....	....	....	......	— 7 72
1	3 96	3 43	20 56	10 28	0 42	8	2,938	11,495	....	....	44 92	22 46	12 18
2	4 85	6 32	26 85	13 42	0 17	8	5,372	11,098	....	....	64 80	32 40	18 98
1	2 80	..	13 54	6 72	......	...	.....	......	....	....	....	......	— 6 72
1	4 22	....	13 79	6 89	......	.....	......	.....	11,968	....	59 84	29 92	23 03
2	9 63	......	17 49	8 74	......	.....	......	......	......	....	....	....	— 8 74
12	46 46	20 66	184 13	91 98	....	......	.....	......	....	....	386 65	193 32	101 34
......	2 58	1 14	10 22	10 22	......	....	...	.....	....	....	21 48	21 48	11 26

The following brief summary compares the chief items in the rotations tabled in detail above.

Cost of Operations, Value of Products, and Profits of Rotations 'C,' 'J,' 'P' and 'R.'

Rotation.	Area.	Total Cost to Operate.	Total Value of Products.	Total Profit.	Profit per Acre.
	Acres.	$ cts.	$ cts.	$ cts.	$ cts.
'C' (3 years duration)	6	46 96	70 28	23 32	3 89
'J' (6 ")	12	87 71	154 39	66 68	5 56
'P' (8 ")	16	173 46	295 90	122 44	7 65
'R' (9 ")	18	184 13	386 65	202 52	11 26

CULTURAL EXPERIMENTS.

An extensive set of experiments in soil cultivation and management has been inaugurated, but the work is not yet far enough advanced for the publication of results. We indicate below merely the various lines which we are investigating to show the purpose and extent of this work. Next year we hope to have results that will demonstrate their usefulness, though necessarily many years will be required to gather conclusive evidence on some of the problems taken up.

Briefly, these experiments are as follows:—

Experiment 1—Prairie breaking.

" 2A—Depth of ploughing wheat stubble to be sown to oats.
" 2B—Depth of ploughing summer-fallow in preparation for wheat.
" 2C—Depth of ploughing sod in preparation for wheat followed by oats.
" 3—Summer-fallow treatment.
" 4—Treatment of wheat stubble to be sown to wheat, and to oats.
" 5—Seeding of grass and clover.
" 6—Breaking sod from cultivated grasses and clovers.
" 7A—Applying barnyard manure for corn or roots.
" 7B—Applying barnyard manure for wheat.
" 7C—Applying barnyard manure for barley.
" 7D—Applying barnyard manure for oats.
" 8—Green manuring.
" 9—Seed-bed preparation.
" 10A—Soil packing for whea following summer-fallow.
" 10B—Soil packing for wheat on spring ploughed stubble land.
" 10C—Soil packing for wheat on fall ploughed stubble land.
" 11—Depth of seeding.
" 12—Commercial fertilizers.
" 13—Underdraining.

EXPERIMENTAL STATION FOR NORTH-WESTERN SASKATCHEWAN, SCOTT, SASK.

REPORT OF THE SUPERINTENDENT, R. E. EVEREST, B.S.A.

ROTATION OF CROPS.

Continuous cropping with grain is bound ultimately to exhaust the available store of plant food laid up in a soil, and is likely to favour the growth of many of the obnoxious weeds that are already too apparent in our midst. In order to compare methods of cropping commonly used, and to learn the possibility and advisibility of growing a greater variety of crops, several rotations have been started. We cannot yet, of course, speak advisedly of the merits of these rotations, but we publish them in the belief that their final outcome will be followed with interest by farmers working under conditions such as obtain here.

Rotation 'A.'

Wheat continuously.

Rotation 'J.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat or coarse grain.
Fourth year.—Oats. Seeded down with rye grass, red clover and alfalfa.
Fifth year.—Hay.
Sixth year.—Pasture.

Rotation 'P.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat.
Fourth year.—Summer-fallow.
Fifth year.—Roots or peas. Manured at rate of 15 tons per acre.
Sixth year.—Barley. Seeded down with rye grass, red clover and alfalfa.
Seventh year.—Hay.
Eighth year.—Pasture.

Rotation 'R.'

First year.—Summer-fallow.
Second year.—Hoed crop or peas. Manured at rate of 15 tons per acre.
Third year.—Wheat.
Fourth year.—Oats.
Fifth year.—Summer-fallow.
Sixth year.—Wheat.
Seventh year.—Oats. Seeded down with rye grass, red clover and alfalfa.
Eighth year.—Hay.
Ninth year.—Pasture.

CULTURAL EXPERIMENTAL WORK.

The mere following of a rotation, no matter how well suited to dry farming conditions it may be, is not sufficient to insure good crops from year to year. Soil cultivation within the rotation must be the second great consideration. In order to learn something of the merits of different methods and practices commonly used, a series of soil cultivation experiments is being started. As yet just a beginning has been made, but we hope in a few years to have obtained useful knowledge along many lines of soil management, about which little reliable information is to be had at the present time.

The new lines of work begun are as follows:—

Experiment 1—Prairie breaking.
" 5—Seeding to grass and clover.
" 10A—Soil packing for wheat sown on summer-fallow.
" 10B—Soil packing for wheat sown on spring-ploughed stubble land.
" 10C—Soil packing for wheat sown on fall-ploughed stubble land.
" 11—Depth of seeding.

Of this new work, experiment 11 is the only one sufficiently long under way to warrant publication of results. We present them herewith, together with the results of other experiments of a similar nature.

DEPTH OF SEEDING.

Experiments in seeding wheat and oats to depths of 1, 2, 3 and 4 inches resulted as follows:—

Depths of Seeding Wheat.

Variety.	Depth of Seeding.	Yield of Grain per Acre.	Yield of Grain per Acre.	
		Lb.	Bush.	Lb.
Marquis	1 inch	2,280	38	00
"	2 inches	2,200	36	40
"	3 "	2,360	39	20
"	4 "	2,320	38	40

The wheat plot sown to a depth of three inches produced the greatest yield of grain, which fact is further emphasized by observations made in general farm practice in the district.

Depths of Seeding Oats.

Variety.	Depth of See ing.	Date of Sowing.	Date of Ripening.	Number of Days to Mature.	Yield of Grain per Acre.	Yield of Grain per Acre.	
					Lb.	Bush.	Lb.
Banner	1 inch	May 1	Sept 11	133	3,720	109	14
"	2 inches	" 1	" 11	133	4,160	122	12
"	3 "	" 1	" 11	133	4,440	130	20
"	4 "	" 1	" 11	133	4,080	120	00

Four different depths were employed in the seeding of oats, namely, one, two, three and four inches. The plot sown at a depth of three inches gave the largest yield of grain, which fact points to the advantage of seeding oats to a good depth under conditions such as exist here.

DATES OF SEEDING.

Experiments to learn the best time for sowing spring wheat, oats and barley in this district gave the following results this year:—

Dates of Seeding Spring Wheat.

Variety.	Date. of Sowing.	Date of Ripening.	Number of days to Mature.	Average length of straw including head.	Strength of straw on scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
				Inches.		Inches.	Lb.	Bush. Lb.
Marquis........	April 15..	Aug. 30..	137	32	10	3¼	1,570	26 10
"	" 20..	" 30..	132	32	10	3¼	1,440	24 00
"	" 29..	Sept. 3..	127	34	10	3	1,840	30 40
"	May 6..	" 3..	120	38	10	3	1,80C	30 00

It will be noted that the third date of seeding gave the largest return. This may probably be partly accounted for by the unusually heavy rainfall in July, which favoured the later crops.

Dates of Seeding Oats.

Variety.	Date of Sowing.	Date of Ripening.	Number of days to Mature.	Average length of straw including head.	Strength of straw on scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
				Inches.		Inches.	Lb.	Bush. Lb.
Banner........	April 13..	Sept. 13..	153	59	5	10	4,189	123 7
"	" 20..	" 13..	146	61	4	9	4,720	138 28
"	" 29..	" 13..	137	60	3	9½	4,510	132 22
"	May 6..	" 13..	130	70	2	11	3,960	116 16

Dates of Seeding Barley.

Variety used.	Date of sowing.	Date of ripening.	No. of days to mature.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
				Inches.		Inches.	Lb.	Bush Lb.
Manchurian	April 15..	Aug. 28..	135	45	5	4	2,800	58 16
" ...	" 22..	Sept. 3..	134	47	4	3	3,200	66 32
" ...	" 29.	" 3..	127	41	3	3	3,280	68 16
" ...	May 6..	" 3..	120	42	2	3	3,680	76 32

The latest sowing, on May 6, gave the highest yield. This plot would receive the greatest benefit from the late rains which, in part at least, accounts for the decided advantage it gave over the earlier seeding dates.

QUANTITIES OF SEED PER ACRE.

This test was conducted with spring wheat, oats and barley.

QUANTITIES of Spring Wheat per Acre.

Variety.	Quantities of seed per acre.	Date of sowing.	Date of ripening	Number of days to mature.	Average length of straw including head.	Strength of straw on scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
					Inches.		Inches.	Lb.	Bush. Lb.
Marquis	¾ bush.	April 15	Aug. 30	137	40	10	3¼	1,200	20 00
"	1¼ "	" 15	" 30	137	33	10	3	1,560	26 00
"	1¾ "	" 15	" 30	137	34	10	3¼	1,570	26 10
"	2¼ "	" 15	" 30	137	32	10	3¼	1,320	22 00
"	2¾ "	" 13	" 30	137	24	10	3½	1,160	19 20

One and three-quarter bushels per acre was the amount of seed giving the largest yield. After the quantity of seed sown is deducted, it will be seen that one and one-quarter bushels per acre gave the largest net return. With the knowledge at present available for this district, one and three-quarter bushels per acre may be expected to give the best results.

QUANTITIES of Oats per Acre.

Variety.	Quantities of seed per acre.	Date of sowing.	Date of ripening.	Number of days to mature.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
					Inches.		Inches.	Lb.	Bush. Lb.
Banner.	1 bush.	Apr. 24	Sept. 13	142	67	5	10	4,760	140 00
"	1½ "	" 24	" 13	142	69	4	12	3,480	102 12
"	2 "	" 24	" 13	142	60	4	10	4,200	123 18
"	2½ "	" 24	" 13	142	62	3	10½	3,360	98 28
"	3 "	" 24	" 13	142	58	3	9	3,240	95 10
"	3½ "	" 24	" 13	142	64	3	10½	2,880	84 24

Of six different amounts used, the lightest seeding, that of one bushel per acre, gave the highest yield. This result was scarcely to be expected, but to some extent it was due to the plot standing more erect for ripening and harvesting than those of heavier seeding. The quantity of straw was in excess of the usual growth. This exceptional result is not sufficient evidence on which to recommend a reduction of the quantity of seed oats generally sown.

QUANTITIES of Barley per Acre.

Variety.	Quantities of seed per acre.	Date of sowing.	Date of ripening.	Number of days to mature.	Average length of straw including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.
					Inches.		Inches.	Lb.	Bush. Lb.
Manchurian.	1 bush.	Apr. 23	Aug. 28	127	46	5	3	4,000	83 16
"	1½ "	" 23	" 28	127	42	5	3½	3,880	80 40
"	2 "	" 23	" 28	127	39	4	3¼	3,360	70 00
"	2½ "	" 23	" 28	127	40	4	2¾	3,080	64 8
"	2 "	" 23	" 28	127	39	4	3¼	3,000	62 24

Of the five amounts used, the lightest seeding, one bushel per acre gave the best return. The thin seeding maintained its upright growth to a greater extent than the heavier-sown plots, permitted a more complete harvesting of the grain produced, and encouraged the full development of the maturing kernels. This result may be regarded as somewhat of an exception and not sufficiently conclusive to warrant any reduction of the amount of seed generally used.

WEATHER CONDITIONS.

In 1912 conditions at time of seeding were favourable. After seeding, germination was uniform and the grain crops had a good start. During May the rainfall was moderate, amounting to 2·46 inches. In June the precipitation was 2·19 inches. This rainfall for June was associated with hot weather which tended to hasten maturity of early varieties of grain at a sacrifice of yield. In July a very heavy rainfall was recorded, the total being 6·16 inches. This amount of moisture, coming late in the season benefited the slower-maturing grains to some extent. However, a second growth was so encouraged that the sample in many cases was marred by the immature grain appearing among the good. The length of the growing season made it possible for all crops to mature, September 15 being the date of the first damaging frost.

SOME Weather Observations taken at Scott Experimental Station, 1912.

Month.	Temperature F.			Precipitation.				Total sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hrs.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	31·8	—43·3	—15·3	....	3·7	3·70	·15	100·8
February	36·5	—30·3	6·28	....	·8	·08	·05	97·3
March	46·0	—31·8	11·9	....	2·3	2·30	·23	199·0
April	68·5	12·2	40·6	....	....	....	....	235·9
May	85·0	24·7	49·4	2·46	....	2·46	·62	255·5
June	95·5	28·7	61·7	2·19	....	2·19	·80	343·0
July	88·0	34·2	58·0	6·16	....	6·16	1·00	183·5
August	81·0	32·9	59·7	2·93	....	2·93	·73	192·5
September	74·5	15·7	45·6	2·01	....	2·01	·98	132·7
October	75·0	14·2	39·9	·05	1·0	·15	·05	161·0
November	47·0	8·2	27·0	....	2·0	·20	·15	84·9
December	44·1	—19·8	16·8	....	2·7	·27	·05	91·3
	....	....	....	....	....	22·45	....	2077·4

YIELD OF FIELD CROPS.

WHEAT.

Two varieties of wheat, Marquis and Huron, were grown in field lots. Both varieties were sown on fallowed land and received similar treatment. From each field a very fair crop of grain was obtained, Huron leading by four bushels per acre. This variety is a favourable yielder at this Station. Marquis was grown on other fields, which received varying treatment. Pea ground, spring ploughed, gave a larger crop of better quality grain than did wheat stubble, fall ploughed. Wheat stubble, fall ploughed, gave a greater yield than wheat stubble not ploughed. The stubbled-in field required less time to mature, but was very low in yield per acre.

Yields of Spring Wheat in Field Lots.

Variety.	D te of sowing.	Date of ripening.	No. of days maturing.	Previous treatment.	Yield of grain per acre.	Yield of grain per acre.	
					Lb.	Bush.	Lb.
Huron........	April 20....	Aug. 30....	132	Summer-fallow.............	1,883	31	23
Marquis	" 27....	" 30....	125	Summer-fallow.	1,637	27	17
"	" 27....	" 30....	125	Pea ground, spring ploughed	1,519	25	19
"	" 20....	" 30....	132	Wheat land, fall ploughed..	1,150	19	10
"	" 26....	" 24....	120	Sown on wheat stubble.....	686	11	26

OATS.

Two varieties of oats were grown in field lots, Abundance and Banner. Both varieties received similar treatment, being grown on spring-ploughed wheat stubble, which had been broken in 1910.

The Abundance variety gave the larger yield per acre by about ten bushels. Banner was also a good crop, beautiful in straw and grain.

Yield of Oats in Field Lots.

Variety.	Date of sowing.	Date of ripening.	No. of days maturing.	Previous crop.	Yield of grain per acre.	Yield of grain per acre.	
					Lb.	Bush.	Lb.
Abundance. ..	May 3......	Sept. 9.....	129	Wheat land, spring ploughed.	3,130	92	2
Banner.......	" 2	" 7.....	128	Wheat land, spring ploughed.	2,815	82	27

BARLEY.

One variety of six-rowed barley was grown in the field. This barley, Manchurian, made a very nice growth, the crop standing well and threshing a fair yield of grain. The sample was lacking somewhat in size and colour. It was sown on pea ground, spring ploughed, on May 3, ripened on August 23, and yielded 53 bushels 22 pounds per acre.

PEAS.

One variety of peas was grown in the field. The growth throughout the season was good, and the threshed result of fully matured grain is of particular importance to this portion of the province. The Arthur variety, used on this field area, seems best adapted to our need in a field pea. It was sown on May 3, on summer-fallowed ground, ripened on September 10 and yielded at the rate of 35 bushels 1 pound per acre.

SUMMARY OF CROPS, 1912.

	Bushels.	Pounds.
WHEAT.		
Two varieties in field lots 16 acres	375	....
Uniform test plots	11	22
Cultural experiment plots	59	31
Total	445	53
OATS.		
Two varieties in field lots 8½ acres	685	1
Uniform test plots	61	29
Cultural experiment plots	15	8
Total	762	4
BARLEY.		
One variety in field lot 1½ acres	80	10
Uniform test plots	23	31
Total	103	41
PEAS.		
One variety in field lot 3⅝ acres	131	14
Uniform test plots	3	34
Total	134	48
Spring rye	....	28
Flax	1	36
Potatoes	569	3
Roots	351	25
Corn	....	943
HAY.		
Western Rye Grass and clover	10 tons.	610

EXPERIMENTAL STATION FOR SOUTHERN ALBERTA, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

THE SEASON.

The season of 1912 resembled that of 1911 in that the rainfall during the early part was deficient, while during the latter part the usual amount was received.

The results of the crops on the Station during the summer of 1912 have been interesting, although in many instances somewhat disappointing. The season opened up in a most propitious manner. Work on the land began on March 28, and the first seeding was done on April 1, although it would have been possible to have begun a little earlier. The soil was left moist from the fall of 1911 and the land was in excellent shape to work in the spring; consequently, the grain crops, in fact all crops planted, were put in under exceedingly favourable conditions where land had been prepared the summer or fall previous. However, the rainfall during April, May and until the end of June in the immediate vicinity of Lethbridge was extremely light. Grain sown on summer-fallowed land and on very early spring ploughing, where the land was cultivated immediately afterwards, came up well, because it was possible to place the seed in moisture. Germination on land that was not so treated was not good.

On account of the previous season closing up so early in the fall of 1911 it was impossible for the farmers in southern Alberta to do much fall ploughing, the result being that a great deal of grain was 'stubbled' in this past spring, and most of this, in the Lethbridge district, germinated poorly.

The rainfall was very light, indeed, until the last few days in June; from then on, during July, August and September it was above normal. On account of this light rainfall during the first part of the growing season, all early sown crops, and especially winter wheat, suffered acutely. Crops that looked extremely promising early in the season gave but low yields. Late-sown crops, on the other hand, did much better providing they ripened before the frost.

The yield of all the crops on the non-irrigated portion of the station was rather low, with the exception of peas and such late growing crops as turnips, potatoes, etc.

On the irrigated portion of the Station, however, where water was applied in June, and in some cases even in May, the yields were very much more satisfactory. In the case of hay, however, especially alfalfa, we found the rainy season rather difficult to operate in, as it was hard to get it cured properly. Alfalfa usually makes its most rapid growth when supplied with the necessary moisture during the hot weather of July and August, but this year, on account of the many showers during this period, the weather was not so hot as it ordinarily is, so the alfalfa fields did not produce quite as much as they usually do.

SOME Weather Observations taken at Lethbridge Experimental Station, 1912.

Month.	Temperature F.			Precipitation.				Total sunshine.
	Highest.	Lowest.	Mean.	Rainfall.	Snowfall.	Total.	Heaviest in 24 hours.	
	°	°	°	Inches.	Inches.	Inches.	Inches.	Hours.
January	46·1	-23·8	14·13	....	6·9	·69	·34	111·7
February	49·2	-23·5	28·07	....	4·0	·40	·20	140·6
March	63·3	-22·5	19·04	....	4·4	·44	·22	230·9
April	69·1	17·4	44·33	0·20	....	·20	·08	209·9
May	82·8	23·6	51·94	0·66	....	·66	·26	280·4
June	94·8	28·3	62·41	1·73	....	1·73	·66	322·7
July	86·6	36·0	58·57	2·78	....	2·78	·37	250·6
August	88·7	35·1	60·61	1·41	....	1·41	·37	240·1
September	76·7	23·1	47·07	2·61	....	2·61	1·19	169·3
October	71·4	14·2	42·34	0·02	10·5	1·07	·57	172·9
November	57·4	10·1	39·51	....	9·9	·99	·66	129·3
December	50·1	-0·9	27·16	....	2·3	·23	·20	102·3
Total	....	....	....	9·41	38·0	13·21	....	2360·6

YIELDS OF GRAIN IN FIELD LOTS.

WINTER WHEAT (NON-IRRIGATED).

The following fields of Kharkov winter wheat were sown September 2, 1911, on summer-fallowed land ploughed the different depths indicated in the table.

DEPTHS of Ploughing for Winter Wheat.

Area.	Depth ploughed.	Date ripe.	Yield of grain per acre.	
Acres.	Inches.	1912.	Bush.	Lb.
1·02	6	July 21	23	32
1·06	5	July 21	20	55
1·02	4	July 21	18	33

On September 12, 1911, 3·32 acres of Ghirka winter wheat were sown on summer-fallowed land. This was ripe on July 30, and yielded at the rate of 28 bushels per acre.

OATS (NON-IRRIGATED).

A field of Banner oats, 15·73 acres in size, was sown on land on which grain had been grown the year previous. It was sown on April 24 and ripened August 23. The field yielded at the rate of 45 bushels and 25 pounds per acre, but was considerably damaged by the cutworms.

OATS (IRRIGATED).

The following field lots of oats were grown in 1912:—

Variety.	Area.	Preparation of land.	Date sown.	Date ripe.	Date irrigated.	Yield per acre.	
	Acres.					Bush.	Lb.
Banner	·12	Spring ploughed alfalfa sod	April 15	Sept. 13	June 4	100	00
Banner	·32	Land on which grain was grown in 1911	" 17	Aug. 21	" 4	94	7
Banner	2·64	Summer-fallow	" 6	" 13	" 11	132	19
Banner	5·39	Grain in 1911	" 27	" 27	" 12	67	11

BARLEY (IRRIGATED).

The following fields of barley were grown in 1912:—

Variety.	Area.	Condition of land, 1911.	Date sown.	Date ripe.	Date irrigated.	Yield per acre.	
	Acres.					Bush.	Lb.
Swedish Chevalier....	·087	In peas....	Apr. 29 ...	Aug. 9...	June 11....	57	16
Mansfield.......... ...	·46	In peas.........	" 29....	" 8....	" 11....	37	28
Odessa....	·29	In peas...... .	" 29....	" 6....	" 11....	50	2
Claude	·65	In peas...... ...	" 29....	" 7....	" 11....	55	20
O. A. C. No. 21.......	·037	In alfalfa.......	" 26....	" 6....	" 5....	49	26
Swedish Chevalier.....	·22	Hoed crops.....	" 26. ..	" 20....	" 8....	99	34
Clifford.............	·4	Summer-fallow.	" 29....	" 20....	" 11....	88	31

PEAS (IRRIGATED).

The following field lots of peas were grown in 1912:—

Variety.	Area.	Date sown.	Date ripe.	Date irrigated.	Condition of land in 1911.	Yield per acre.	
	Acres.					Bush.	Lb.
Paragon........ .. .	·52	Apr. 2	Sept. 13....	June 5.....	Grain	62	10
Mackay..............	·049	Apr. 2....... ..	Sept. 14....	June 5.....	Grain	74	50

EXPERIMENTS ON NON-IRRIGATED LAND.

ROTATIONS.

In the tables below are given the results obtained in the various rotations on the non-irrigated land. Some heavy yields are recorded, notably the turnips on rotation 'T.' They produced 25 tons per acre, and gave a net profit of $36.43.

In computing the results given, fixed valuations for the items debited and credited to the rotations were adopted.

The following values have been fixed:—

Return Values.

Wheat (from the machine)....................................	per lb.	$1\frac{1}{2}$c.
Barley " "	"	1c.
Oats " "	"	1c.
Peas " "	"	$1\frac{1}{2}$c.
Flax " "	"	3c.
Timothy hay	per ton.	$10 00
Red Clover hay	"	10 00
Alfalfa hay	"	12 00
Brome-Grass hay	"	10 00
Western Rye Grass hay	"	10 00
Mixed hay	"	10 00
Green hay	"	10 00
Oat straw	"	2 00
Barley straw	"	2 00
Wheat straw	"	1 00

Pea straw	per ton.	$2 00
Flax straw	"	2 00
Dry corn stalks	"	5 00
Corn ensilage	"	3 00
Mangels and turnips	"	3 00
Sugar beets	"	4 00
Pasture, each horse	per month.	1 00
" " cow	"	1 00
" " sheep	"	25

Cost Values.

Rent	per acre.	$2 00
Barnyard manure spread on fields (charged equally over all years of the rotation)	per ton.	1 00
Seed wheat	per acre.	1 50
Seed oats	"	1 00
Seed barley	"	1 00

All other seeds to be charged at actual cost. Cost of grass seed to be charged equally on the years producing grass. Twine charged at actual cost.

Machinery	"	60
Manual labour	per hour.	19
Horse labour (including teamster)—		
Single horse	"	27
Two-horse team	"	34
Three-horse team	"	41
Four-horse team	"	48
Additional horses	each hour.	7

(Work done by traction engine is to be converted into the amount of horse labour required to do the work and charged accordingly.)

Threshing (covering work from stook to granary)—		
Wheat	per bush.	7
Oats	"	4
Barley	"	5
Flax	"	12
Peas	"	7

Rotation 'A.'

Wheat continuously.

Rotation 'V.'

Alfalfa continuously.

Rotation 'B.'

First year.—Summer-fallow.
Second year.—Wheat.

Rotation 'C.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat or coarse grain.

Rotation 'M.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Coarse grain. Manure on stubble in fall.
Fourth year.—Summer-fallow.
Fifth year.—Peas and oats for hay.
Sixth year.—Barley or oats.

Rotation 'S.'

First year.—Summer-fallow. Manured in preparation for hoed crops.
Second year.—Hoed crops.
Third year.—Wheat.
Fourth year.—Summer-fallow.
Fifth year.—Wheat.
Sixth year.—Coarse grain.
Seventh year.—Summer-fallow.
Eighth year.—Peas and oats for hay. Seeded in fall to rye.
Ninth year.—Rye pasture.

Rotation 'T.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Oats or barley.
Fourth year.—Summer-fallowed May. Seeded to alfalfa late in June in rows 28 inches apart.
Fifth year.—Alfalfa hay or seed.
Sixth year—Alfalfa hay or seed.
Seventh year.—Alfalfa hay or pasture.
Eighth year.—Summer-fallow.
Ninth year.—Hoed crops.
Tenth year.—Wheat. Manure applied on stubble.

ROTATION

Rotation Year.	Location.	Area.	Crop.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual Labour: Hours.	Manual Labour: Cost.	Horse labour (including teamster): Hours: Single horse.	2-horse team	3-horse team	4-horse team	Value of horse labour.
		Ac.	1912.	$ c.	$ c.	$ c.	$ c.	No.	No.	No.	No.	$ c.
A 1..	Lot 1...	1·57	Wheat........	3 14	5 26	$1\frac{2}{3}$	0 32	....	$1\frac{1}{2}$	......	$8\frac{7}{12}$	4 63
	Aggregate....................			3 14	5 26	......	0 32	......	......	......	......	4 63
	Average per acre in 1912......			2 00	3 35	......	0 20	......	......	......	......	2 96
ROTATION												
V 1..	Lot 1...	1·06	Alfalfa..........	3 18	0 64	35	6 65	......	$8\frac{3}{4}$	......	......	2 98
	Aggregate....................			3 18	0 64	......	6 65	......	.....	......	.....	2 98
	Average per acre in 1912........			3 00	0 60	.....	6 27	......	......	......	......	2 81
ROTATION												
B 2...	Lot 1..	1·57	Wheat..........	3 14	3 73	$5\frac{1}{2}$	1 05	......	.....	$1\frac{3}{12}$	$1\frac{1}{6}$	1 07
B 1...	" 2..	1·57	Summer-fallow..	3 14	0 94	....	......	......	....	......	$18\frac{7}{12}$	8 92
	Aggregate....................			6 28	4 67	......	1 05	....	.....	......	......	9 99
	Average per acre in 1912........			2 00	1 49	......	0 33	......	......	......	......	3 18
ROTATION												
C 2...	Lot 1..	1·57	Wheat..........	3 14	3 67	5	0 95	......	......	$1\frac{1}{4}$	$1\frac{1}{12}$	1 03
C 3...	" 2..	1·57	Oats..........	3 14	2 73	1	0 19	......	$1\frac{1}{6}$	....	$7\frac{1}{3}$	3 92
C 1...	" 3..	1·57	Summer-fallow..	3 14	0 94	......	......	......	......	......	$14\frac{1}{12}$	6 76
	Aggregate....................			9 42	7 34	6	1 14	......	......	.....	......	11 71
	Average per acre in 1912.......			2 00	1 56	......	0 24	......	......	......	......	2 49
ROTATION												
M 2..	Lot 1..	1·25	Wheat........	5 00	3 27	$3\frac{2}{3}$	0 70	......	.....	$1\frac{1}{6}$	$0\frac{55}{60}$	0 92
M 3..	" 2..	1·25	Oats...........	5 00	2 27	1	0 19	......	$1\frac{1}{6}$	......	$5\frac{1}{3}$	2 96
M 4..	" 3..	1·25	Summer-fallow..	5 00	0 75	.....	......	......	......	......	$12\frac{2}{3}$	6 08
M 5..	" 4..	1·25	Peas and oats...	5 00	2 00	$5\frac{1}{12}$	0 97	...	$5\frac{1}{12}$	.....	$1\frac{1}{4}$	2 33
M 6..	" 5.	1·25	Oats..........	5 00	2 27	1	0 19	......	$2\frac{25}{60}$	......	6	3 71
M 1..	" 6..	1·25	Summer-fallow..	5 00	0 75	......	......	......	......	......	$12\frac{1}{2}$	6 00
	Aggregate....................			30 00	11 31	......	2 05	......	......	......	......	22 20
	Average per acre in 1912........			4 00	1 51	.....	0 27	......	......	......	.....	2 96

"A."

in raising Crop.					Particulars of Crop.							
					Weight in Pounds.							
Cost of threshing.	Total cost.	Cost of 1 acre.	Cost of 1 bushel.	Height of stubble.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre.	Notes.
$ c.	$ c.	$ c.	$ c.	In.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.	
2 25	15 60	9 94	0 31	7	1,931	2,877	......	.. ..	27 19	17 32	7 38	75 p.c. of crops was eaten by cutworms, and re-sown with Marquis wheat which got frosted before it was cut.
2 25	15 60	......	.....	......	......	.....	......	. . .	27 19	....	.... ..	
1 43	9 94	9 94	......	.....	......	......	......	......	17 32	17 32	7 38	
"V."												
......	13 45	12 69	......	$2\frac{1}{2}$	.....	......	13,235	......	79 41	74 92	62 23	Three cuttings of alfalfa were made. It was irrigated twice, and ditch water was emptied into it afterwards.
......	13 45	. . ..	....	......	......	.....	13,235	......	79 41	....	......	
......	12 69	12 69	......	.....	......	......	12,486	....	74 92	74 92	62 23	
"B."												
2 96	11 95	7 61	0 28	7	2,540	2,990	......	.....	35 37	22 53	14 98	
.....	13 00	8 28	......	......	......	.....	......	....	......	.....	...	
......	24 95	15 89	.....	......	2,540	2,990	...	......	35 37	22 53	...	
. ...	7 95	7 95	. ...	......	809	952	.....	......	11 26	11 26	3 31	
"C."												
2 64	11 43	7 28	0 30	7	2,260	2,630	..	......	31 45	20 03	12 72	
3 74	13 27	8 74	0 14	7	3,176	2,600	......	......	34 36	21 88	13 14	
......	7 70	4 90	.....	....	.....	....	......	......	......	.....	......	
6 38	32 85	20 92	....	.....	5,436	5,230	......	......	65 81	41 91	......	
1 35	6 97	6 97	.....	....	1,154	1,111	......	......	13 97	13 97	7 00	
"M."												
1 75	11 64	9 32	0 46	......	1,475	1,845	.....	......	20 59	16 48	7 16	
2 52	12 94	10 35	0 20	......	2,144	1,892	......	......	23 33	18 66	8 32	Cutworms damaged the oats.
......	11 83	9 46	.....	...	.....	......	.....	......	......	....	......	
......	10 30	8 24	...	.... .	. ..	......	5,840	. ..	29 20	23 36	15 12	
3 20	14 37	11 50	0 18	......	2,713	2,511	......	. .	28 64	22 91	11 49	
......	11 75	9 40	......	......	......	... .	......	.....	....	......	......	
7 47	72 83	58 26	......	....	....	....	....	.....	101 76	81 41	......	
1 00	9 31	9 31	. ...	. ...	......	..	.....	.....	13 56	13 56	4 25	

ROTATION

Rotation Year.	Location.	Area.	Crop.	Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Horse labour (including teamster.) Hours. Single horse.	2-horse team	3-horse team	4-horse team	Value of horse labour.
		Ac.	1912.	$ c.	$ c.	No.	$ c.	No.	No.	No.	No.	$ c.
S 9...	Lot 1..	1·25	Rye pasture	4 17	1 17	......	.... .	.....	$1\frac{55}{60}$	... .	$5\frac{1}{4}$	3 17
S 1...	" 2..	1·25	Summer-fallow..	4 17	0 75	......	... ..	......	......	......	$9\frac{1}{12}$	4 36
S 2..	" 3..	1·25	Corn............	4 17	2 65	29	5 51	$9\frac{3}{4}$	$2\frac{1}{4}$	.....	$11\frac{55}{60}$	9 12
S 3...	" 4..	1·25	Wheat..........	4 17	2 89	$2\frac{1}{3}$	0 44	......	$1\frac{1}{4}$	.....	$\frac{1}{2}$	0 67
S 4...	" 5..	1·25	Summer-fallow.	4 17	0 75	......	.... .	......	......	......	$12\frac{5}{8}$	6 16
S 5...	" 6..	1 25	Wheat	4 17	2 91	2	0 38	......	......	$1\frac{1}{3}$	$\frac{55}{60}$	0 92
S 6...	" 7 .	1·25	Oats.....	4 17	2 32	1	0 19	......	$1\frac{1}{3}$	......	$5\frac{55}{60}$	3 29
S 7...	" 8..	1·25	Summer-fallow..	4 17	0 75	.....	......	......	......	...	$10\frac{1}{2}$	5 04
S 8...	" 9..	1·25	Oats and peas...	4 17	2 00	$5\frac{3}{4}$	1 09	. ....	$4\frac{5}{6}$	....	6	4 54
	Aggregate ..		....	37 53	16 19	......	7 61	......	.... .	... .	.....	37 27
	Average per acre in 1912........			3 33	1 44	......	0 62	....	......	..	. . .	3 31

ROTATION

Rotation Year.	Location.	Area.	Crop.	Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Single horse.	2-horse team	3-horse team	4-horse team	Value of horse labour.
T 8..	Lot 1..	1·57	Alfalfa..........	5 02	1 24	$3\frac{1}{3}$	0 66	$5\frac{1}{4}$	1	......	$\frac{11}{30}$	1 92
T 9..	" 2..	1·57	Alfalfa..........	5 02	1 24	$3\frac{1}{2}$	0 66	$5\frac{1}{4}$	1	......	$\frac{11}{30}$	1 92
T 10..	" 3.	1·57	Alfalfa..........	5 02	1 24	$3\frac{1}{2}$	0 66	$5\frac{1}{4}$	1	......	$\frac{11}{30}$	1 92
T 1..	" 4..	1·57	Summer-fallow..	5 02	0 94	. ..	..	......	......	......	15	7 20
T 2..	" 5..	1·57	Turnips.	5 02	3 04	$86\frac{3}{4}$	16 48	$10\frac{3}{4}$	....	......	$25\frac{25}{30}$	15 20
T 3..	" 6.	1·57	Wheat.........	5 02	3 62	$2\frac{1}{2}$	0 47	......	$1\frac{1}{3}$	.....	$1\frac{1}{4}$	0 92
T 4..	" 7..	1·57	Summer-fallow..	5 02	0 94	... .	.. ...	.....	......	......	$15\frac{25}{30}$	7 44
T 5..	" 8..	1·57	Wheat...... ...	5 02	3 70	$4\frac{1}{4}$	0 81	......	......	$1\frac{1}{2}$	$\frac{3}{4}$	0 97
T 6..	" 9..	1·57	Oats......	5 02	2 85	1	0 19	......	$1\frac{1}{3}$	.....	$5\frac{3}{4}$	3 16
T 7..	" 10 .	1 57	Seeded to alfalfa	5 02	1 24	$4\frac{1}{3}$	0 82	$\frac{1}{2}$	$4\frac{2}{3}$	......	$6\frac{1}{3}$	4 75
	Aggregate..................			50 20	20 09	.... ..	20 75	......	.. .	......	. . .	45 30
	Average per acre in 1912........			3 20	1 28	. .	1 32	......	.....	......	. . .	2 89

"S."

in raising Crop.					Particulars of Crop.							
					Weight in Pounds.							
Cost of threshing.	Total cost.	Cost of 1 acre.	Cost for 1 bushel.	Height of stubble.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre.	Notes.
$ c.	$ c.	$ c.	$ c.	Ins.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.	
....	8 51	6 81	....	....	....	....	....	....	2 00	1 60	....	62 days pasture for 1 cow.
....	9 28	7 42	....	....	....	....	....	....	....	....	....	
....	21 45	17 16	....	4½	....	....	....	11,150	16 73	13 38	3 78	
2 37	10 34	8 27	0 33	7	1,878	2,333	....	....	26 21	20 97	12 70	
....	11 08	8 86	....	....	....	....	....	....	....	....	....	
1 89	10 27	8 21	0 38	7	1,605	2,315	....	....	22 56	18 05	12 24	
3 40	13 37	10 69	0 15½	7	2,881	2,551	....	....	28 06	22 45	14 69	
....	9 96	7 97	....	....	....	....	....	....	....	....	....	Manured.
....	11 80	9 44	....	....	....	....	7,000	....	35 00	28 00	23 20	Seeded in fall to rye.
....	106 06	84 83	....	....	....	....	....	....	130 56	104 45	....	
....	9 43	9 43	....	....	....	....	....	....	11 61	11 61	2 18	

"T."

Cost of threshing.	Total cost.	Cost of 1 acre.	Cost for 1 bushel.	Height of stubble.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre.	Notes.
3 55	12 39	7 89	3 76	3	213	....	....	....	85 20	54 28	46 39	Seed saved, Grimm.
3 55	12 39	7 89	3 76	3	213	....	....	....	85 20	54 28	46 39	Seed saved, Grimm.
3 55	12 39	7 89	3 76	3	213	....	....	....	85 20	54 28	46 39	Seed saved, Grimm.
....	13 16	8 38	....	....	....	....	....	....	....	....	....	
....	39 64	25 25	0 03	....	....	....	....	78,575	117 86	75 07	49 82	
2 59	12 62	8 04	0 32	7	2,210	3,110	....	....	31 02	19 76	11 59	
....	13 40	8 53	....	....	....	....	....	....	....	....	....	
2 45	12 95	8 25	0 36	7	21 05	2,625	....	....	29 38	18 71	10 46	
4 08	15 30	9 81	0 15	7	3,456	3,000	....	....	37 56	23 92	14 17	
....	11 83	7 54	....	....	....	....	....	....	....	....	....	
....	156 07	99 47	....	....	....	....	....	....	471 42	300 30	200 86	
....	9 94	9 94	....	....	....	....	....	....	30 03	30 03	20 09	

The following is a summary of the above tables:—

COSTS, Values of Products and Profits of Rotations 'A,' 'V,' 'B,' 'C,' 'M,' 'S' and 'T.

Rotation.	Total Cost per Acre.	Total Value per Acre.	Net Profit per Acre.
	$ cts.	$ cts.	$ cts.
'A' wheat continuously	9 94	17 32	7 38
'V' Alfalfa continuously	12 69	74 92	62 23
'B' two years' duration	7 95	11 26	3 31
'C' three years' duration	6 97	13 97	7 00
'M' six years' duration	9 31	13 56	4 25
'S' nine years' duration	9 43	11 61	2 18
'T' ten years' duration	9 94	30 03	20 09

CULTURAL EXPERIMENTS.

A comprehensive set of experiments in soil cultivation has been undertaken, but we do not feel it advisable to publish the results of the work this year, as it was more or less of a preparatory nature.

The lines of investigation along which we are working are as follows:—

Experiment 1 —Prairie breaking.
" 2A—Depth of ploughing wheat stubble to be sown to oats.
" 2B—Depth of ploughing summer-fallow to be sown to wheat followed by oats.
" 2C—Depth of ploughing sod to be sown to wheat, followed by oats.
" 3—Summer-fallow treatment previous to sowing wheat.
" 4A—Treatment of wheat stubble to be sown to wheat.
" 4B—Treatment of wheat stubble to be sown to oats.
" 5—Seeding to grass and clover.
" 6—Breaking sod from cultivated grasses and clovers.
" 7A—Applying barnyard manure for corn or roots.
" 7B—Applying barnyard manure for wheat.
" 7C—Applying barnyard manure for barley.
" 7D—Applying barnyard manure for oats.
" 8—Green manuring.
" 9—Seed-bed preparation.
" 10A—Soil packing for wheat sown on summer-fallow.
" 10B—Soil packing for wheat sown on spring-ploughed wheat stubble.
" 10C—Soil packing for wheat sown on fall-ploughed wheat stubble.
" 11—Depth of seeding.
" 12—Commercial fertilizers.
" 13—Underdraining.

DATES OF SEEDING.

Marquis Wheat (Non-irrigated).

DATES of Seeding Marquis Wheat.

Date sown.	Date ripe.	Size of plot.	Length of straw.	Length of head.	Weight of straw per acre.		Yield per acre.	
		Acres.	Inches.	Inches.	Tons.	Lb.	Bush.	Lb.
April 1	August 7	1/60	24	2½		1,500	25	
April 12	August 8	1/60	24	2½		1,680	24	
April 22	August 8	1/60	24½	2½		1,620	23	
May 1	August 17	1/60	28½	3		1,290	23	30
May 11	August 23	1/60	31½	2¾		1,800	21	
May 22	September 16	1/60	35	2½		....	*20	
May 31	September 16	1/60	34	2½	1	430	*25	30
June 11	September 16	1/60	36½	3	1	1,110	*26	30

*Grain badly frosted. Was not ripe at time of killing frost September 14 and 15.

Kharkov Winter Wheat (Non-irrigated).

The table would indicate that September 1 was the best date to seed. From our observations we are of the opinion that from August 20 to September 1 is about the best period for the Lethbridge district.

DATES of Seeding Kharkov Winter Wheat.

Date Sown.	Date Ripe.	Size of plot.	Length of Straw	Length of head.	Weight of straw.	Yield per acre.		Average yield per acre for 4 years.	
1911.	1912.	Acres.	Inches.	Inches.	Lb.	Bush.	Lb.	Bush.	Lb.
July 15	July 24	1-20	25	2½	1640	7	50	4	37*
August 2	July 24	1-20	25	2¼	1240	12	00	12	6*
August 15	July 24	1-20	26½	2¾	1280	12	40	23	51
September 1	July 24	1-20	26	2½	1620	18	20	28	30
September 15	July 29	1-20	27	2½	1570	19	40	22	32
October 2	Aug. 5	1 20	25	2½	1310	15	30	19	00
October 16	....	1-20	24	2½	1700	24	00	18	00
November 2	Aug. 12	1-20	25	2½	1650	22	20	13	42

* Average yield for three years only.

Banner Oats (Non-irrigated.)

An experiment was started with dates of seeding oats, the first seeding being done on April 1, and the last on July 2. The land was summer-fallowed in 1911.

DATES of Seeding Banner Oats.

Date Sown.	Date Ripe.	Length of straw.	Length of head.	Weight of straw per acre.		Yield per acre.		Size of plots.
		Inches.	Inches.	Tons	Lb.	Bush	Lb.	Acres.
April 1	August 17	32	5½	1	880	68	28	1-60
April 15	August 17	30	5½	1	760	67	2	1-60
May 1	August 17	33	6	1	940	77	22	1-60
May 16	August 23	34	7	1	1480	93	18	1-60
May 31	September 14	38	7	1	1960	86	16	1-60
June 15	Cut for green feed September 15.							
July 2	Cut for green feed September 15.							

Mensury Barley (Non-irrigated).

An experiment was started with dates of seeding barley, the first seeding being done on April 1, and the last on July 2. The land was summer-fallowed in 1911.

DATES of Seeding Mensury Barley.

Date sown.	Date ripe.	Size of plot.	Length of straw.	Length of head.	Weight of straw, per acre.		Yield per acre.	
		Acres.	Inches.	Inches.	Tons.	Lb.	Bush.	Lb.
April 1	August 10	1/60	27	2·5	1	400	26	12
April 15	August 10	1/60	26	2·5	1	400	27	24
May 1		1/60	28	2·5	1	520	32	24
May 16	August 23	1/60	34	3·2	1	400	26	12
May 31	August 30	1/60	34½	3·2	1	970	29	18
June 15		1/60	38	3¼	1	840	*40	00
July 2		1/60	33	3	2	140	*26	12

* Grain frosted on September 14 and 15, almost ripe.

Flax (Non-irrigated).

An experiment with dates of seeding flax was begun this season. It was sown on summer-fallowed land in plots one-sixtieth of an acre in size. The first seeding was made April 1, and the last July 2. As will be noticed in the table given below all the flax sown on and after May 15 was frosted.

DATES of Seeding Flax.

Date sown.	Date ripe.	Length of straw.	Weight of straw per acre.	Yield per acre.		Remarks.
		Inches.	Pounds.	Bush.	Lb.	
April 1........	August 24. . . .	19	1,680	23	32	
April 15........	August 27......	20	1,740	27	42	
May 1........	August 30	23	2,460	25	40	
May 15........	Sept. 16*. ...	24	2,340	25	40	Frosted September 14 and 15.
May 31........	Sept. 16*.....	25	3,240	27	42	Frosted September 14 and 15.
June 15........	Sept. 16*.....	24½	2,430	13	22	Frosted September 14 and 15.
July 2.......	....	....	....	....	....	Cut for green feed Sept. 16.

*Date cut.

RATES OF SEED PER ACRE.

Kharkov Winter Wheat (Non-irrigated).

In these experiments the winter wheat was sown on summer-fallowed land.

RATES of Seeding Kharkov Winter Wheat.

Rate per acre.	Size of plot.	Date sown.	Date ripe.	Length of straw.	Length of head.	Weight of straw.		Yield per acre.		Average yield per acre for 4 years.	
Lb.	Acres.	1911.	1912.	Inches.	Inches.	Tons.	Lb.	Bush.	Lb.	Bush.	Lb.
15	1/20	Sept. 1....	Aug. 5. ..	29	2¾	..	1,460	18	20	25	25
30	1/20	Sept. 1....	July 31....	27	2¼	..	1,750	23	50	30	57
45	1/20	Sept. 1....	July 27....	26	2¼	1	140	23	00	32	27
60	1/20	Sept. 1....	July 27....	28	2¾	1	240	27	00	37	43
75	1/20	Sept. 1....	July 27....	26	2¾	..	1,910	23	20	38	6
90	1/20	Sept. 1....	July 27....	25½	2¼	..	1,980	24	20	37	50
105	1/20	Sept. 1....	July 24....	26	2¼	..	1,500	23	20	34	22
120	1/20	Sept. 1....	July 24....	25	2¼	..	1,300	21	40	34	30

Red Fife Wheat (Non-irrigated).

RATES of Seeding Red Fife Wheat.

Rate per acre.	Size of plots.	Date sown.	Date ripe.	Length of straw.	Length of head.	Weight of straw.		Yield per acre.		Average yield per acre for 4 years.	
Lb.	Acres.	1912.	1912.	Inches.	Inches.	Tons.	Lb.	Bush.	Lb.	Bush.	Lb.
15	1/20	April 1....	Aug. 20....	37½	3	.	1840	16	40	11	55
30	1/20	April 1....	Aug. 17.. .	35	3	1	120	19	40	16	15
45	1/20	April 1....	Aug. 15....	33	3	..	1600	25	00	21	15
60	1/20	April 1....	Aug. 12....	30	2¾	.	1980	24	00	21	40
75	1/20	April 1....	Aug. 12 ...	30	3	1	80	26	20	22	25
90	1/20	April 1 ...	Aug. 11....	31	3	1	240	25	00	22	15
105	1/20	April 1....	Aug. 10...	28½	3	1	60	25	00	23	45
120	1/20	April 1 ...	Aug. 9....	26	3	..	1810	23	40	23	..

Banner Oats (Non-irrigated.)

The size of the plots used was one-twentieth acre each and they were all sown April 15. Banner oats were used and they were sown on summer-fallowed land.

RATES of Seeding Banner Oats.

Rate per acre.	Size of plot.	Date sown.	Date ripe.	Length of straw.	Length of head.	Weight of straw.		Yield per acre.		Average yield per acre for 4 years.	
Lbs.	Acres.	1912.	1912.	Inches.	Inches.	Tons.	Lb.	Bush.	Lb.	Bush.	Lb.
15	1/20	Apr. 15.....	*	38	6½	1	860	73	18	42	22
30	1/20	Apr. 15.....	*	35	6	1	1,080	67	2	49	24
45	1/20	Apr. 15.....	*	35	6	1	440	70	00	52	22
60	1/20	Apr. 15.....	*	33	6	1	1,290	65	30	54	8
75	1/20	Apr. 15.....	Aug. 17. ..	32	5¼	1	640	72	12	54	18
90	1/20	Apr. 15.....	Aug. 5....	32	5½	1	450	49	4	49	28
105	1/20	Apr. 15.....	Aug. 5....	32	5¼	1	510	55	30	50	15
120	1/20	Apr. 15.....	Aug. 1....	32	6¼	0	1,870	48	18	45	2

Mensury Barley (Non-irrigated).

The results would seem to indicate that 90 pounds was about the right amount to sow per acre. We find that from 85 to 90 pounds is about the right amount to use here.

RATES of Seeding Mensury Barley on Summer-fallow.

Rate per acre.	Size of plot.	Date sown.	Date ripe.	Length of straw.	Length of head.	Weight of straw per acre.		Yield per acre.		Average yield per acre for 3 years.	
Lb.	Acres.	1912.	1912.	Inches.	Inches.	Tons.	Lb.	Bush.	Lb.	Bush.	Lb.
15	1/20	Apr. 18....	Aug. 8.....	27	2	..	1,710	20	30	9	45
30	1/20	Apr. 18....	Aug. 7. ...	26	2·5	..	1,920	23	36	13	16
45	1/20	Apr. 18 ...	Aug. 6.....	27	2	..	1,310	15	00	15	00
60	1/20	Apr. 18...	Aug. 3.....	20	2	..	1,820	18	36	18	00
75	1/20	Apr. 18 ...	Aug. 3.....	22	2	1	200	15	20	19	41
90	1/20	Apr. 18....	Aug. 1.....	22½	2	1	460	26	32	24	5
105	1/20	Apr. 18....	Aug. 1.....	22	2	1	320	30	20	25	30
120	1/20	Apr. 18 ...	Aug. 1.....	21	2	..	1,700	25	00	22	44

EXPERIMENTS ON IRRIGATED LAND.

Rotation 'U.'

In this rotation wheat yielded 29 bushels per acre, and gave a net profit of $36.43. Potatoes on alfalfa sod yielded 757 bushels per acre making the rather phenomenal net profit of $307.38 per acre with the potatoes valued at 50 cents per bushel.

Rotation 'U.'

First year.—Seeding alfalfa.
Second year.—Alfalfa hay.
Third year.— "
Fourth year.— "
Fifth year.— "
Sixth year.— "
Seventh year.—Hoed crops.
Eighth year.—Wheat.
Ninth year.—Wheat or coarse grain.
Tenth year.—Coarse grain.

ROTATION

Rotation Year.	Location.	Area.	Crops. Last Year.	Crops. This Year.	Items of: Rent and Manure.	Seed, Twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.
		Acres.	1911	1912.	$ c.	$ c.	No.	$ c.
U 2..	Lot 1..	1·00	Seeded to Alfalfa	Alfalfa	4 20	1 48	26	4 95
U 1..	" 2 .	"	Oats	Seeded to Alfalfa	4 20	1 56	$8\frac{2}{3}$	1 61
U 10..	" 3..	"	Oats	Oats	4 20	1 81	$6\frac{1}{4}$	1 19
U 9..	" 4..	"	Wheat	Oats	4 20	1 81	$5\frac{1}{6}$	98
U 8..	" 5..	"	Potatoes	Wheat	4 20	2 31	$8\frac{1}{2}$	1 61
U 7..	" 6..	"	Alfalfa	Potatoes	4 20	16 10	$150\frac{5}{12}$	28 59
U 6..	" 7..	"	"	Alfalfa	4 20	1 48	$24\frac{3}{20}$	4 59
U 5..	" 8..	"	"	"	4 20	1 48	27	5 13
U 4..	" 9..	"	"	"	4 20	1 48	27	5 13
U 3..	" 10..	"	"	"	4 20	1 48	27	5 13
Aggregate					42 00	30 99	....	58 91
Average per acre in 1912					4 20	3 10	....	5 89

"U"

Expense in Raising Crop.										Particulars of Crop.						
Horse labour (including teamster.)										Weight in Pounds.						
Hours.																
Single horse.	2-horse team	3-horse team	4-horse team	Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Height of stubble.	Grain.	Srtaw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre.
No.	No.	No.	No.	$ c.	$ c.	$ c.	$ c.	$ c.	In.	Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
...	7¼	...	1/6	2 55	.. ..	13 18	13 18	....	3	....	......	8,351	....	50 11	50 11	36 93
1/3	2 1/3	....	4 1/12	2 90	.. .	10 27	10 27	..	3	......	......	3,310	.. .. .	16 55	16 55	6 28
...	1 5/6	....	7 5/6	4 33	2 36	13 89	13 89	23½	8	2,000	1,544	....	.. ....	21 54	21 54	7 65
...	1 5/6	....	4 5/6	2 89	2 36	12 24	12 24	21	8	2,000	1,691	....	.... .	21 69	21 69	9 45
...	1 5/6	... .	1	1 10	4 13	13 35	13 35	22½	9	3,540	5,157	....	......	49 78	49 78	36 43
8⅓	30 1/6	....	20¼	22 23	......	71 12	71 12	9	....	.....	......	.. . .	45,420	378 50	378 50	367 38
...	7¾	....	1/5	3 87	......	14 14	14 14	....	3	.....	....	11,730	.. ....	70 38	70 38	56 24
...	10	...	1⅓	3 65	... .	14 46	14 46	....	3	... .	......	10,842	....	65 05	65 05	50 59
...	10	....	...	3 40	...	14 21	14 21	...	3	......	......	10,842	......	65 05	65 05	50 84
...	10	....	...	3 40	.....	14 21	14 21	....	3	....	....	10,842	.... ..	65 05	65 05	50 84
..	...	....	...	50 32	8 85	191 07	191 07	...	....	......	.. ...	. .....	....	803 70	803 70	......
..	....	....	...	5 03	89	19 11	19 11	....	....	.. ..	......	. ....	. .....	80 37	80 37	61 26

Rates of Seeding.

Spring Wheat (Irrigated.)

The size of the plots used was one-thirtieth of an acre. They were sown April 2 on summer-fallowed land. The variety used was Red Fife. One irrigation was given on June 8. We now have results from five seasons.

Rates of Seeding Spring Wheat.

Rate per acre.	Size of plot.	Date sown.	Date ripe.	Length of Straw.	Length of head.	Weight of straw per acre.		Yield per acre.		Average yield per acre for 5 years.	
Lb.	Acres.	1912.	1912.	Inches.	Inches.	Tons.	Lb.	Bush.	Lb.	Bush.	Lb.
15	1/30	Apr 2....	Aug. 23..	50	3.7	3	730	56	..	34	..
30	1/30	Apr. 2 ...	Aug. 23..	49.2	3.5	3	1,470	63	30	40	30
45	1/30	Apr. 2 ...	Aug. 20..	50	3.5	3	420	63	..	41	42
60	1/30	Apr. 2....	Aug. 20 .	44.5	3.5	3	630	63	..	41	52
75	1/30	Apr. 2....	Aug. 14..	43	3.5	3	495	61	45	44	25
90	1/30	Apr. 2 ...	Aug. 14..	47	3.5	3	60	64	..	45	34
105	1/30	Apr. 2....	Aug. 14..	43.5	3.5	3	660	66	30	47	51
120	1/30	Apr. 2....	Aug. 13..	41.5	3.5	2	1,280	62	..	43	50

Oats (Irrigated.)

In the following experiment the size of the plots used was one-twentieth of an acre. They were sown April 15 on land on which hoed crops were grown in 1911. The variety used was Banner. One irrigation was given on June 4. We now have the results for five years from this experiment.

Rates of Seeding Oats.

Rate per Acre.	Size of Plot.	Date Sown.	Date Ripe.	Length of Straw.	Length of Head.	Weight of Straw per Acre.		Yield per Acre.		Average yield per Acre for 5 years.	
Lb.	Acres.	1912.	1912.	Inches.	Inches.	Tons.	Lb.	Bush.	Lb.	Bush.	Lb.
15	$\frac{1}{20}$	Apr. 15..	Aug. 23..	44·5	7·5	1	490	69	24	67	.
30	$\frac{1}{20}$	" 15..	" 22..	43	7	2	80	110	..	78	18
45	$\frac{1}{20}$	" 15..	" 15..	43	7	1	980	106	16	79	18
60	$\frac{1}{20}$	" 15..	" 14..	41	6·5	1	1,100	108	28	85	16
75	$\frac{1}{20}$	" 15..	" 14..	41	5·5	1	1,280	112	12	87	21
90	$\frac{1}{20}$	" 15..	" 13..	40·5	6	1	1,020	102	12	88	15
105	$\frac{1}{20}$	" 15 .	" 12..	40·5	7	1	1,200	108	28	87	18
120	$\frac{1}{20}$	" 15..	July 31..	40	7·7	1	740	101	26	83	2

Barley (Irrigated.)

In the following experiments, the size of the plots used was one-thirtieth of an acre, they were sown on April 17 on summer-fallowed land. One irrigation was given on June 8. We now have results from five seasons.

Rates of Seeding Barley.

Rates per acre.	Size of plot.	Date sown.	Date Ripe.	Length of straw.	Length of head.	Weight of straw per acre.		Yield per acre.		Average yield per acre for 5 years.	
Lb.	Acres.	1912.	1912.	Inches.	Inches.	Tons.	Lb.	Bush.	Lb.	Bush.	Lb.
15	1/30	Apr. 17...	Aug. 3 ..	40	3.2	2	380	77	24	41	16
30	1/30	Apr. 17...	Aug. 2...	39	3.5	2	590	104	18	53	18
45	1/30	Apr. 17...	Aug. 1...	39	3.5	2	350	96	42	54	42
60	1/30	Apr. 17...	Aug. 1...	40	3.7	2	1,340	95	..	56	24
75	1/30	Apr. 17...	Aug. 1...	39	3.7	..	..	99	18	53	7
90	1/30	Apr. 17...	Aug. 1...	39	3.5	1	1,720	85	..	51	6
105	1/30	Apr. 17...	July 31...	38.5	3.5	1	1,090	98	6	47	24
120	1/30	Apr. 17...	July 31...	39	3.2	2	980	99	18	49	18

EXPERIMENTAL STATION FOR CENTRAL ALBERTA, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

ROTATION OF CROPS.

The following rotations reported upon last year, have been continued.

Rotation 'C.'

First year.—Summer-fallow.
Second year.—Wheat.
Third year.—Wheat, or coarse grain.

Rotation 'K.'

First year.—Hoed crop—peas—mixed grain.
Second year.—Wheat.
Third year.—Oats or barley. Seeded down per acre as follows: one-third, alsike clover 6 pounds and rye grass 10 pounds; one-third, alsike clover 6 pounds, alfalfa [illegible] pounds and timothy 3 pounds; one-third, alsike clover 2 pounds, red clover 6 pounds, timothy 2 pounds and rye grass 2 pounds.
Fourth year.—Hay. Manured in autumn, 12 tons per acre.
Fifth year.—Pasture.
Sixth year.—Pasture. Ploughed July after haying, in preparation for roots.

Rotation 'L.'

First year.—Hay.
Second year.—Pasture. Manured in autumn, 12 tons per acre.
Third year.—Pasture. Break July, for fall wheat.
Fourth year.—Grain. Winter wheat, or, in case of failure, spring wheat.
Fifth year.—Oats.
Sixth year.—Barley. Seeded down with 4 pounds timothy, 4 pounds alsike and 4 pounds red clover per acre.

Rotation 'N.'

First year.—Alfalfa. Seeded down with no nurse crop.
Second year.—Alfalfa hay. Manured 6 tons per acre, autumn.
Third year.—Alfalfa hay.
Fourth year.—Alfalfa hay. Manured 6 tons per acre, autumn.
Fifth year.—Alfalfa hay. Break after first cutting.
Sixth year.—Winter wheat. In case of failure, sow spring wheat.
Seventh year.—Grain.

Rotation 'O.'

First year.—Hoed crops, or peas and oats mixed, cut early, and land disced and cultivated in fall.

Second year.—Wheat.

Third year.—Oats.

Fourth year.—Summer-fallow.

Fifth year.—Barley. Seeded down with 3 pounds timothy, 2 pounds alsike and 6 pounds alfalfa per acre.

Sixth year.—Hay. Manured in fall 6 tons per acre.

Seventh year.—Pasture. Portion intended for roots the following year to be ploughed early July.

The following values have been fixed:

Return Values.

Wheat (from the machine)	per lb.	$1\frac{1}{3}$c.
Barley " "	"	1c.
Oats " "	"	1c.
Peas " "	"	$1\frac{1}{2}$c.
Flax " "	"	3c.
Timothy hay	per ton.	$10 00
Red Clover hay	"	10 00
Alfalfa hay	"	12 00
Brome Grass hay	"	10 00
Western Rye Grass hay	"	10 00
Mixed hay	"	10 00
Green hay	"	10 00
Oat straw	"	2 00
Barley straw	"	2 00
Wheat straw	"	1 00
Pea straw	"	2 00
Flax straw	"	2 00
Dry corn stalks	"	5 00
Corn ensilage	"	3 00
Mangels and turnips	"	3 00
Sugar beets	"	4 00
Pasture, each horse	per month	1 00
" " cow	"	1 00
" " sheep	"	25

Cost Values.

Rent	per acre.	$2 00
Barnyard manure spread on fields (charged equally over all years of the rotation)	per ton.	1 00
Seed wheat	per acre.	1 50
Seed oats	"	1 00
Seed barley	"	1 00
All other seeds to be charged at actual cost. Cost of grass seed to be charged equally on the years producing grass. Twine charged at actual cost.		
Machinery	"	60
Manual labour	per hour.	19
Horse labour (including teamster)—		
Single horse	"	27
Two-horse team	"	34
Three-horse team	"	41
Four-horse team	"	48
Additional horses	each hour.	7
(Work done by traction engine is to be converted into the amount of horse labour required to do the work and charged accordingly.)		
Threshing (covering work from stook to granary)—		
Wheat	per bush	7
Oats	"	4
Barley	"	5
Flax	"	12
Peas	"	7

ROTATION

Rotation Year.	Location.	Area.	Crops. 1911.	Crops. 1912.	Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Horse Labour Hours. Single horse.	Horse Labour Hours. 2-horse team.
		Ac.	1911.	1912.	$ c.	$ c.	No.	$ c.	No.	No.
C 2...	Plot 1....	1·0	Summer-fallow.	Barley	2 00	3 58	2½	0 47	....	3
C 3...	" 2....	1·0	Wheat........	Barley........	2 00	3 48	2½	0 47	....	4
C 1...	" 3....	1·0	Wheat........	Summer fallow	2 00	0 60	....	....	....	1¾
Aggregate........					6 00	7 66	5·00	0 94	....	8¾
Average per acre in 1912........					2 00	2 55	1 66	0 31	....	2·55

ROTATION

Rotation Year.	Location.	Area.	Crops. 1911.	Crops. 1912.	Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Horse Labour Hours. Single horse.	Horse Labour Hours. 2-horse team.
K 3..	Plot 1....	3·909	Wheat........	Barley.......	15·64	7 23	5¼	1 00	....	7¾
K 4..	" 2....	3·909	Barley........	Hay..........	15 64	5 87	14¾	2 81	....	15
K 4..	" 3....	3·909	Oats..........	Hay..........	15 64	5 87	10	1 90	....	14
K 4..	" 4....	3·909	Oats..........	Hay..........	15 64	5 87	16¼	3 09	....	14¾
K 1..	" 5....	3·909	Green feed.....	Hoed crop....	15 64	32 43	329	62 51	36	48½
K 2..	" 6....	3·909	Hoed crop.....	Wheat	15 64	9 55	8¼	1 57	....	7
Aggregate........					93 84	66 82	383½	72 88	....	107
Average per acre in 1912........					4 00	2 85	15·21	3 11	....	4·34

ROTATION

Rotation Year.	Location.	Area.	Crops. 1911.	Crops. 1912.	Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Horse Labour Hours. Single horse.	Horse Labour Hours. 2-horse team.
L 2...	Plot 1....	1·74	Hay..........	Pasture.......	6 96	2 39	....	....	....	....
L 3...	" 2....	1·74	Hay..........	Pasture.......	6 96	2 39	....	....	....	....
L 4...	" 3....	1·74	Hay..........	Wheat	6 96	4 94	3¼	0 62	....	18
L 5...	" 4....	1·74	Wheat........	Oats..........	6 96	3 21	4	0 76	....	3
L 6...	" 5....	1·74	Oats..........	Barley........	6 96	3 32	1¼	0 24	....	2
L 1...	" 6....	1·74	Barley........	Hay..........	6 96	2 39	6¼	1 19	....	6¾
Aggregate........					41 76	18 64	14¾	2 81	....	29¾
Average per acre in 1912........					4 00	1 79	1·25	0 27	....	2·51

ROTATION

Rotation Year.	Location.	Area.	Crops. 1911.	Crops. 1912.	Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Horse Labour Hours. Single horse.	Horse Labour Hours. 2-horse team.
N 3..	Plot 1....	1·085	Alfalfa........	Alfalfa........	4.03	4.87	9¾	1.85	....	5¼
N 4..	" 2....	1·085	Alfalfa........	Alfalfa........	4.03	4.87	6¾	1.28	....	2¾
N 5..	" 3....	1·085	Alfalfa........	Alfalfa........	4.03	4.87	6¾	1.28	....	2¾
N 6..	" 4....	1·085	Alfalfa........	Alfalfa........	4.03	4.87	6¾	1.28	....	2¾
N 7..	" 5....	1·085	Alfalfa........	Alfalfa........	4.03	4.87	6¾	1.28	....	2¾
N 1..	" 6....	1·085	Alfalfa........	Spring Wheat.	4.03	2.66	4	0.76	....	10¼
N 2..	" 7....	1·085	Green feed.....	Barley........	4.03	2.16	2	0.38	....	11¼
Aggregate........					28.21	29.17	42¾	8.11	....	37¾
Average per acre in 1912........					3.71	3.84	6·2	1.07	....	4·58

"C."

in Raising Crop.								Particulars of Crop.						
(including teamster.)								Weight in Pounds.						
Hours.														
2-horse team.	4-horse team.	Value of Horse Labour.	Cost of threshing.	Total cost.	Cost of 1 acre.	Cost of 1 bushel.	Height of stubble.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit of crop per acre.
No.	No.	$ c.	$ c.	$ c.	$ c.	cts.	In.	No.	No.	No.	No.	$ c.	$ c.	$ c
1¼	......	1 53	1 74	9 32	9 32	26	.....	1,675	5,419	...	...	22 17	22 17	12 85
1¼	......	1 87	1 56	9 38	9 38	30	.....	1,500	3,504	......	...	18 50	18 50	9 12
....	9¾	5 27	......	7 87	7 87	......	......	.....	..	..	......	.....	......	—7 87
2½	9¾	8 67	3 30	26 57	.....	...	.....	3,175	8,923	......	....	40 67	......	14 10
·50	3·15	2 89	1 10	....	8 86	.....	.....	1,058	2,974	......	....	......	13 56	4 70

"K."

......	11¼	8 03	4 85	36 75	9 40	37	.....	4,660	6,759	......	......	53 36	13 65	4 25
......	.....	5 10	....	29 42	7 53	...	......	...	......	13,304	...	67 29	17 21	9 68
......	...	4 76	......	28 17	7 21	...	......	......	......	10,166	.....	51 60	13 20	5 99
......	..	5 01	...	29 61	7 57	.....	......	......	......	9,200	......	46 00	11 77	4 20
......	11¼	31 61	....	142 19	36 37	......	......	......	......	......	19,036	99 61	25 48	-10 89
......	4¾	4 66	8 33	39 75	10 17	33	......	7,140	16,938	......	......	103 67	26 52	16 35
......	27¼	59 17	13 18	305 89	.....	......	......	11,800	23,697	32,670	19,036	421 53	....	29 58
.....	1·10	2 32	0 56	......	13 04	......	....	503	1,010	1,393	812	.....	17 97	4 93

'L."

......	....	....	......	9 35	5 37	......	......	......	....	......	.....	4 55	2 61	—2 76
......	......	....	....	9 35	5 37	...	......	......	....	......	...	3 38	1 94	—3 43
......	3½	7 80	2 95	23 27	13 37	55	......	2,530	9,327	......	......	38 39	22 06	8 69
1½	6	4 51	3 64	19 08	10 97	20	......	3,090	7,759	.....	......	38 66	22 22	11 25
......	8¼	4 64	2 30	17 46	10 03	38	......	2,205	3,035	......	......	25 08	14 41	4 38
... ..	.....	2 29	.....	12 83	7 37	......	......	....	.....	7,520	......	38 73	22 26	14 89
1½	17¾	19 24	8 89	91 34	... ..	......	......	7,825	20,121	7,520	......	148 79	.....	33 02
·09	1·42	1 84	0 85	......	8 75	..	......	750	1,927	720	.....	......	14 25	5 50

"N."

......	.....	1.78	......	12.53	11.55	......	......	......	......	5,456	......	32.74	30.17	18.62
......	......	0.93	....	11.11	10.24	.....	...	....	......	3,140	....	18.84	17.36	7.12
......	..	0.93	......	11.11	10.24	....	...	....	......	3,140	....	18.84	17.36	7.12
......	......	0.93	......	11.11	10.24	......	......	...	......	3,140	......	18.84	17.36	7.12
......	......	0.93	......	11.11	10.24	..	......	......	....	3,140	......	18.84	17.36	7.12
.....	¾	3.84	2.45	13.74	12.66	39	.....	2,100	7,285	......	......	31.64	29.16	16.50
......	......	3.82	2.32	12.71	11.71	27	.....	2,230	2,546	..	......	24.85	22.90	11.19
... ..	¾	13.16	4.77	83.42	......	......	......	4,330	9,831	18,016	......	164.59	....	74.79
......	·06	1.73	0.63	10.98	10.98	......	.....	570	1,294	2,372	......	......	21.67	10.69

ROTATION

Rotation Year.	Location	Area.	Crops.		Items of Expense: Rent and manure.	Seed, twine and use of machinery.	Manual Labour. Hours.	Manual Labour. Cost.	Horse labour Hours. Single horse.	Horse labour Hours. 2-horse team.
		Acres	1911.	1912.	\$ c.	\$ c.	No.	\$ c.	No.	No.
O 3..	Plot 1....	3·2107	Wheat	Oats..........	9.18	6.38	6½	1.24	....	10¾
O 4..	" 2 ...	2·727	Oats	Summ'r-fallow	7 79	1.64	....	....	... .	2¼
O 5..	" 3....	3·266	Summer-fallow.	Barley........	9.33	10 10	12¼	2.33	....	21¼
O 6..	" 4....	4·119	Barley	Hay.....	11.78	8.51	10½	2.00	....	14½
O 7..	" 5...	4·119	Oats	Pasture.. . .	11.78	8.51	....	....	....	....
O 1..	" 6....	4·119	Green feed	Hoed crop....	11.78	28.75	336	63 84	41½	80¾
O 2..	" 7....	4·119	Hoed crop.....	Wheat	11.78	9.94	18	3.42	....	7
	Aggregate......				73.42	73.83	383¼	72.83	41½	136½
	Average per acre in 1912..				......	......	....	. ....	....	.. ..

* 33,370 pounds potatoes.
5,410 pounds corn.

"O."

IN RAISING CROPS.								PARTICULARS OF CROP.						
(including teamster.) Hours. 3-horse team.	(including teamster.) Hours. 4-horse team.	(including teamster.) Value of horse labour.	Cost of threshing.	Total cost.	Cost for 1 acre.	Cost for 1 bushel.	Height of stubble.	Weight in Pounds. Grain.	Weight in Pounds. Straw.	Weight in Pounds. Hay.	Weight in Pounds. Potatoes & Corn.	Total value.	Value of crop per acre.	Profit of crop per acre.
No.	No.	$ c.	$ c.	$ c.	$ c.	c.		Lb.	Lb.	Lb.	Lb.	$ c.	$ c.	$ c.
......	15¼	10 97	5.95	33.72	10.50	23	...	5,055	11,819	......	......	62.37	19.39	8.89
......	15⅓	8.21	......	17.64	6.47	......	......	......	......	......	......	......	......	6.47
5	½	9.52	6.45	37.73	11.55	29	......	6,195	13,055	. .	......	75.00	22.90	11 41
......	......	4.93	......	27.22	6.61	.. ...	......	.....	......	17,461	......	87.30	21.19	14 58
......	......	....	... ..	20.29	4.93	......	..	.... .	.. ..	......	.....	2.57	0.62	-4.31
2	15	46.67	......	151.04	36.67	......	......	.... .	......	.....	*38780	291.60	70.79	34.12
......	9½	6.94	9.43	41.51	10.08	31	.. ...	8,084	28,797	... ..	......	122.19	29.66	19.58
7	55¾	87.24	21.83	329.15	. ....	......	.....	19,334	53,671	17,461	38,780	641.03	......	84.27
.....	.....	....	.... .	.. ...	12.40	.. ...	.....	...	. ..	......	.....	.....	23.52	11.12

ROTATION Experiment, Returns and Net Profits, 1912.

Rotation.	Total cost to operate per acre.	Value of returns per acre.	Net profit per acre 1912.
	$ cts.	$ cts.	$ cts.
'C' three years' duration	8.86	13.56	4.70
'K' six years' duration	13.04	17.97	4.93
'L' six years' duration	8.75	14.25	5.50
'N' seven years' duration	10.98	21 67	10.69
'O' seven years' duration	12.40	23.52	11.12

CULTURAL EXPERIMENTS.

Experiments covering a wide variety of cultural methods, have now been under way for two years. This cultural work deals with twelve different lines of cultivation; each branch has been allotted a certain sized block of land which is sub-divided into plots, arranged so as to run a rotation varying in length, according to the information sought. In the case of the experiment seeking information on the question of how best to summer-fallow, for instance, a three-year rotation is followed. Seventeen methods of summer-fallowing are being tried out, one range of seventeen plots being under treatment each year while grain is being grown on each of the other ranges of seventeen plots each, and, by the yields secured over a number of years, the merits of the various systems may be compared.

In planning to secure an answer to the question, 'What is the best previous preparation and seeding practice for seeding down to grass and clover,' a five-year rotation, including fifty-five plots, has been arranged.

The following outline is given of the work being done, but it is perhaps too soon to draw conclusions from results.

A full statement of this work is given in the 'Guide to the Experimental Farms and Stations' for the prairie provinces, available through the Publication Branch, Department of Agriculture, Ottawa.

Depth of ploughing.—Experiment No. 2.—

(*a*) Ploughing on wheat stubble to be sown to oats.
(*b*) Ploughing for summer-fallow.
(*c*) On sod.

Summer-fallow treatment.—Experiment No. 3.
Stubble treatment.—Experiment No. 4.
Seeding to grass and clover.—Experiment No. 5.
Breaking sod from cultivated grasses and clovers.—Experiment No. 6.
Applying barnyard manure.—Experiment No. 7.—

(*a*) On corn or roots.
(*b*) On wheat.
(*c*) On barley.
(*d*) On oats.

Green manuring.—Experiment No. 8.
Seed bed preparation.—Experiment No. 9.

Soil packers.—Experiment No. 10.—
- (*a*) Sowing wheat on summer-fallow.
- (*b*) Sowing on spring-ploughed stubble land.
- (*c*) Sowing on fall-ploughed stubble land.

Depth of seeding.—Experiment No. 11.
Commercial fertilizer.—Experiment No. 12.
Underdraining.—Experiment No. 13.

QUANTITIES OF SEED PER ACRE.

Spring Wheat.

In previous reports, the results of experiments with different quantities of seed per acre have been published. These reports have pointed to the advisability of comparatively heavy seeding for all cereals. Room was not available this year for conducting as wide a range of experiments with different quantities of seed as could have been wished, but the results of such experiments as were conducted point in the same direction as those of previous years. Marquis wheat was sown at the rate of one bushel to the acre, increasing one peck with each plot, up to two bushels per acre. One bushel per acre yielded at the rate of nineteen bushels per acre, while seed used at the rate of two bushels per acre, yielded at the rate of forty-two bushels per acre.

OATS.

Variety.	Quantity of seed.	Date sown.	Date cut.	Yield per Acre.	
				Bush.	Lb.
Banner	1 bushel	April 27	Sept. 20	77	22
"	2 bushels	" 27	" 18	110	20
"	3 "	" 27	" 16	110	20
"	4 "	" 27	" 14	128	

BARLEY.

Mensury barley was sown at the following rates of seed per acre, on one-fortieth acre plots, on April 27.

Variety.	Quantity of seed.	Date sown.	Date cut.	Yield per Acre.	
				Bush.	Lb.
Mensury	1 bushel	April 27	Aug. 20	47	34
"	1½ bushels	" 27	" 19	56	12
"	2 "	" 27	" 18	54	8
"	2½ "	" 27	" 17	57	24
"	3 "	" 27	" 16	52	4
"	3½ "	" 27	" 16	53	36

SOME Weather Observations taken at Lacombe Experimental Station, 1912.

Month.	Temperature—F. Highest.	Lowest.	Mean.	Precipitation. Rainfall.	Snowfall.	Total.	Heaviest in 24 Hours.	Total Sunshine.
			°	Inches.	Inches.	Inches.	Inches.	Hours.
January	42·4	-46·0	5·6	....	7·66	·76	·2	103·5
February	46·8	-23·5	19·55	....	2·00	·20	·1	119·3
March	54·8	-20·0	19·37	....	1·30	.13	1	203·7
April	63·3	17·9	41·85	1·26	....	1·26	·55	196·2
May	82·7	23·5	49·8	2·92	....	2·92	·96	232·9
June	89·6	25·5	59·18	3·00	....	3·00	1·04	304·0
July	78·5	30·4	56·66	5·29	....	5·29	1·32	177.1
August	84·5	30·0	57·7	4·44	....	4·44	1·25	177·7
September	75·8	20·8	46·4	1·27	....	1·27	·35	175·2
October	70·6	13·6	39·24	1·56	....	1·56	·70	147·5
November	58·3	2·9	30·45	....	·93	·09	·30	88·5
December	58·6	-10·6	21·98	....	·08	·008	·05	74.2
Total	....	....	....	19·74	11·97	20·93	....	1999·8

Dominion of Canada

DEPARTMENT OF AGRICULTURE

Dominion Experimental Farms

REPORT

FROM

THE DIVISION OF CHEMISTRY

For the Fiscal Year Ending March 31, 1913

PREPARED BY

Dominion Chemist. - - - - - - - - - - - - - - - - Frank T. Shutt, M.A., F.I.C.

REPORT OF THE DIVISION OF CHEMISTRY.

FRANK T. SHUTT, M.A., F.I.C., F.R.S.C.,
DOMINION CHEMIST.

OTTAWA, March 31, 1913.

J. H. GRISDALE, Esq., B. Agr.,
Director, Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit herewith the twenty-sixth Annual Report of the Division of Chemistry of the Dominion Experimental Farms.

As heretofore, the work of the Chemical Division has been carried forward with a two-fold purpose—the prosecution of research which might lead to the solution of problems in Canadian agriculture, general and specialized, and the more immediate and direct education and assistance of the individual farmer in matters pertaining to his everyday work. Though spoken of here, for the sake of clearness and convenience, as distinct classes of work, there is, at times, no sharp line of demarkation to be drawn between them. One frequently prompts or assists the other and thus it is that many of our investigations of wide importance have been taken in hand as the result of information or suggestion contained in a correspondent's appeal for help. Much of our most fruitful and timely work, yielding results of an essentially practical and widely useful character, has been the outcome of our efforts to obtain the data necessary to enable us judiciously to advise the farmer in his difficulty.

Naturally, no detailed account can be given, in a report of the year's activities, of this branch of our work which seeks directly to advise and inform the farmer. It must, therefore, suffice to say that we have endeavoured to make the Division a bureau of information in matters relating to the chemistry of agriculture to which all may apply, and that there is a steadily increasing number of those who are sending in questions having reference to economical maintenance and increase of soil fertility, the nature and amounts of plant food constituents in manures and fertilizers, the special requirements of crops and farm animals, the relative nutritive values of forage crops and feeding stuffs, the composition of dairy products, the constitution and preparation of insecticides and fungicides and a host of allied subjects in general and specialized farming that call for chemical aid. Our experience of twenty-five years has shown this work of answering inquiries and reporting on samples sent in by farmers to be most useful, giving help when and where it was wanted to those who will benefit by it. It has proved very popular and, we think, successful in disseminating knowledge to those on the farm and, further, has won for our reports and bulletins many interested and earnest readers. This educational work necessarily occupies a considerable portion of the time of the chief of the Division

A classified list of samples received for examination from farmers, and those in connection with the various investigations that have been carried on during the year is presented in the following table. The total number, 2,821, exceeds that of the previous year by nearly 500, and of 1911 by over 1,000, a fair indication of the increasing appreciation on the part of farmers of this branch of our work.

SAMPLES received for Examination and Report for the Twelve Months ended March 31, 1913.

Sample.	British Columbia.	Alberta.	Saskatchewan.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.
Soils	53	604	485	456	52	59	29	27	13	1,778
Muds, mucks and marls	1	......	......	1	....	3	2	2	8	17
Manures and fertilizers	5	4	......	1	12	41	6	12	1	82
Forage plants and fodders	14	38	16	6	127	20	7	6	17	251
Waters	51	23	24	7	215	30	25	8	3	386
Miscellaneous, including dairy products, preservatives, fungicides, insecticides etc	19	7	10	7	225	26	11	2	....	307
	143	676	535	478	631	179	80	57	42	2,821

Conservation of soil moisture.—In many districts of the Northwest the rainfall is sparse and uncertain, and the so-called 'dry-farming' methods, which have for their object the absorption and conservation of the rain for crop use, are in vogue. Deep and early ploughing, subsurface packing, frequent cultivation to ensure a surface mulch of dry earth and to destroy capillarity, and summer fallowing, are among the principal means to that end. To obtain data as to the influence of these cultural operations and systems on crop yields, an extensive series of experiments was inaugurated in 1911 on several of the western Experimental Farms. This investigation is still in progress. To trace the moisture-content of the soil as affected by these operations and systems of soil management and to correlate it with crop yield, it was determined to take soil samples from the several plots periodically throughout the season and to ascertain their percentages of moisture. Data from two seasons' work have already been obtained but a final report will not be made until the close of the experiment, many of the plots being under rotations of from 3 to 5 years' duration. We can, however, at this stage, report several findings of considerable interest which indicate that the available soil-moisture may be very profoundly modified by methods of tillage. The whole question is one of great importance to the farming interests in the prairie provinces.

The influence of environment on the composition of wheat.—This research has thrown much light on the cause of the high quality of our northwestern-grown wheats. It would seem that moisture and temperature conditions during the the filling out of grain may markedly affect its composition. A fairly dry soil and high temperatures during the later summer months, hasten maturity and conduce to a hard berry with a high percentage of gluten. Such conditions frequently prevail over large wheat-growing areas in the prairie provinces during the development of the seed, and no doubt constitute an important factor in determining the quality of the harvested grain. Similarly, it has been found in a semi-arid district that wheat grown under irrigation is always softer, less glutinous, than that (from the same stock) grown on an adjoining area under dry-farming methods. And the same is true for barley.

Further results, obtained by growing wheat from the same stock on the Experimental Farms and Stations across Canada during the season of 1912, are now being reported on. They bear out the conclusions previously reached, and furnish an interesting series indicative of the modifications that may be effected in one season's growth by varying conditions of soil and climate:

Fodders and feeding stuffs.—These, for the most part, comprise the milling by-products and manufactured feeds used in experimental work with stock on the Central Farm, Ottawa; the list, however, contains a number of materials of feeding value sent in by farmers but not coming within the jurisdiction of the Inland Revenue Department, the branch of the Government service undertaking the official analysis of feeding stuffs on the market. The list comprises middlings, shorts, feed flour and mixed meals from oats and barley, bean and rice meals, molasses feeds of various kinds, dried grains from the brewery and distillery, tankage, etc., etc.

The composition of feeds is a matter well worthy of study by farmers and dairymen, and especially so in these days of high prices. There are many 'concentrates' on the market that, with judicious feeding, can give good value, and these are not necessarily low-priced goods—indeed they are more frequently those bringing a good figure per ton but which, nevertheless, are worth it by reason of their high protein and fat-content. There are also many inferior feeds which may almost be said to be dear at any price. Such, for instance, are many of the oat feeds, largely made of the refuse from oat meal and cereal food mills, which contain little protein and fat and are overloaded with indigestible fibre which is not only useless but depresses the value of the other nutrients. These feeds, possibly largely oat hulls, find buyers at $10 to $15 per ton when bran is selling at not more than $20. There is no economy in such practice. Again, there are certain manufactured feeds against which no complaint could be raised as to wholesomeness, but for which extravagant claims are made and extravagant prices are charged. In this class are some of the molasses feeds, certain brands of which are sold much above their value, when their prices are compared with staple milling products. The price of the feed is not an infallible guide to its nutritive value, and the purchaser, when not familiar with the material, would do well to look for the guarantee as to protein and fat-content.

The relative value of field roots.—Twenty-three varieties of mangels, grown on the Central Farm, were submitted to analysis, and very considerable differences in nutritive value were noticed. In dry matter they ranged from 13·38 per cent to 7·87 per cent, and in sugar from 9·15 per cent to 4·75 per cent. The Sugar mangels, the Mammoth Long Red, and the Giant Yellow Intermediate headed the list; the poorer members of the series comprised several varieties of the Yellow Globe mangels. Though not an invariable rule, those containing the larger percentages of dry matter were the richer in sugar, the chief constituent of value from the nutritive standpoint. The averages for the whole series were 9·51 per cent dry matter and 6·43 per cent sugar.

Two well-known and typical varieties, Gate Post and Giant Yellow Globe, grown side by side at Ottawa annually for thirteen years, have been analyzed to ascertain the influence of heredity on composition. Though the differences between them have not been constant throughout this period, the Gate Post has invariably proved the superior root. The averages for the experimental period are: Gate Post, dry matter 11·53 per cent, sugar, 6·16 per cent; for the Giant Yellow Globe, dry matter 9·52 per cent, sugar 4·56 per cent.

Nineteen varieties of turnips were submitted to analysis. Considerable differences as regards dry matter were found, as in the case of mangels, but the sugar-content was fairly constant. Turnips as a class are not so rich in dry matter as mangels, and possess a much lower sugar-content. The best turnip in the series was Carter's Prize Winner, with 10·55 per cent dry matter and 1·23 per cent sugar, closely followed by Hartley's Bronze Top, Kangaroo and Best of All. The limits for the series in dry matter were 10·55 per cent and 5·85 per cent, and the average 8·65 per cent.

Carrots, judging from their composition, are intermediate in food value between mangels and turnips. Six of the prominent varieties were analyzed and the differ-

ences between them, either in dry matter or sugar, are small compared with those noted for other field roots. The first on the list is Giant White Vosges with 11·45 per cent dry matter and 2·83 sugar. The remaining varieties follow in close order, and the averages for the series are 10·50 per cent dry matter and 2·54 per cent sugar. This crop, we have noticed, varies but slightly as to composition from year to year; evidently it is not influenced by seasonal conditions to the same degree as are turnips and mangels.

Sugar beets for factory purposes.—Three varieties of sugar beets—Vilmorin's Improved A, Vilmorin's Improved B, and Klein Wanzleben—have been tested on ten of the Experimental Farms and Stations. The seed was obtained from Messrs. Vilmorin, Andrieux et Cie, Paris, who are recognized as among the foremost firms in Europe for high-quality sugar beet seed.

A survey of the whole series shows remarkably satisfactory results; in the larger number of instances, the beets were exceptionally good, and in one or two cases only—due to unfavourable weather conditions—could the roots be accounted too poor for profitable sugar extraction. Averaging the results from the three varieties at each farm, the highest sugar-content was obtained at Lethbridge, Alta., on the non-irrigated plot (17·86 per cent) and the lowest at Brandon, Man., (13·40 per cent). At three farms in the series, the average sugar-content was above 17 per cent. It has been conclusively shown from this investigation, which has been carried on systematically since 1901, that beets suitable for factory purposes can be grown at widely distant points in the Dominion.

Fertilizing materials.—These include naturally-occurring materials and certain by-products of agricultural value by reason of the plant food they possess. Those analyzed and reported on during the year include marl and similar calcareous deposits, ground limestone, agricultural lime—a product from lime-kilns—gypsum or land plaster, wood-ashes, river, marsh and mussel muds, lobster refuse from the packing houses, dog-fish scrap, a potash residue from the oxygen-acetylene plant, and several other products of fertilizing value.

Many of these can be cheaply obtained and will be found of value in improving tilth and for supplying notable amounts of humus-forming material and plant food. Some of them are of the nature of amendments, others may be ranked with commercial fertilizers, and all may be employed, as conditions dictate, as aids to the maintenance and increase of soil fertility.

Insecticides and fungicides.—The more important materials of this nature examined during the year are included in the following list: Formaldehyde, copper sulphate, agricultural bluestone, Carbolized Wheat Protector, Apterite, lime-sulphur wash, potassium cyanide and lead arsenate.

Only one sample of formaldehyde was found below standard strength. The results generally show that the manufacturers are putting on the market an article of very fairly uniform strength, and in conformity with the guarantee.

Of the samples of bluestone submitted, two were found to contain notable percentages of sulphate of iron; they were in fact agricultural bluestone being sold for bluestone, which is sulphate of copper.

Carbolized Wheat Protector is a preparation found to consist essentially of sulphate of iron and crude carbolic acid. Its effeciency for the prevention of smut in grain is extremely doubtful.

Apterite is a compound described as a soil fumigant and fertilizer. It is essentially a mixture of sulphides of lime (probably gas lime) with napthalene. Experience in Canada with similar preparations is as yet limited, but such as there is has not been very favourable.

Photo by Frank T. Shutt.

The Chemical Laboratory, Central Experimental Farm, Ottawa.

Five brands of lime-sulphur sold in Canada have been analyzed, the sulphide sulphur ranging from 21·87 per cent. to 25·09 per cent., amounts that may be considered satisfactory. The larger number of lime-sulphur washes put on the market by reputable firms have been found of good quality.

Potassium cyanide, when obtained in sealed original containers, has proved of guaranteed strength. This chemical rapidly deteriorates on exposure, so that samples taken from open bottles are frequently of inferior quality.

Very considerable differences in water-content have been found to exist among the various brands of lead arsenate upon the market and our results point to the desirability of obliging the manufacturer to give a guarantee on the label of the package stating the percentage of arsenate of lead present.

The fertilizing value of rain and snow.—The total precipitation, as recorded at the Central Experimental Farm, Ottawa, for the year ending February 29, 1913, was 39·36 inches, 9·62 inches falling in the form of snow. Analysis showed that this furnished 6·144 pounds of nitrogen per acre in forms readily available for crop use. Our records indicate that the proportions of this amount furnished respectively by the rain and snow, have not appreciably varied for the past four years, about eight-tenths of the nitrogen compounds being found in the rain.

The water-supply of farm homesteads.—Of the 386 waters sent in during the year from various parts of the Dominion, 188 have been submitted to a complete sanitary analysis. Of these, eighty-nine were pronounced as pure and wholesome, forty-three as suspicious and probably dangerous, forty-one as seriously contaminated and fifteen as too saline to be used as a potable supply.

The worst waters were from shallow wells dug in barn yards or in the neighbourhood of similar sources of pollution. These merely draw upon the ground water in their immediate vicinity and must become, by reason of their location, contaminated. We strongly advocate the abandonment of such wells. The bored or driven well obtaining its supply from a deep-seated source and below one or more strata of impervious rock, have, as a rule, yielded good water. Both as to quantity and quality, the bored well is more satisfactory than the 'hole' in the ground so commonly found in the country. It is gratifying to note such wells are now replacing the old form of supply on many Canadian farms.

Miscellaneous.—The work of the year has also included the analysis of 185 samples for the Meat Inspection Division, Department of Agriculture. These were collected at the various packing houses in Canada and included twelve lards, fourteen preserved meats, fifty-six dye stuffs and colouring matters, sixty-four preservatives and pickling solutions, thirty-one spices and condiments and eight miscellaneous. This examination is made with a view of determining their nature, purity and character of adulteration, if present.

Samples of water from Coquitlam lake, B.C., the source of the supply for the city of New Westminster, and where a large dam is being constructed, have been examined monthly for the Water-power Branch, Department of the Interior, for which also a number of mechanical analyses of 'fill' used in dam construction in different parts of the Dominion have been made.

For the Dominion Parks Branch, Department of the Interior, we have reported monthly on the water supply used at Banff, Alta. Our analyses show this to be a water of exceptional purity.

Analyses of a number of natural waters have been made at the request of the Department of Marine and Fisheries, with a view to determining if certain alleged pollution might be such as to affect fish life or hatchery operations. We have also for many years past, reported on the composition of dog-fish scrap produced at the Government Reduction Works in the Maritime Provinces.

Acknowledgements.—To Mr. A. T. Charron, M.A., First Assistant Chemist, Mr. C. Robinson, B.A., and Mr. A. T. Stuart, B.A., Assistant Chemists, my sincere thanks are tendered for much valuable assistance in the conduct of the work of the Division. Mr. E. B. Carruthers, M.A., Assistant Chemist, who had had charge of the analytical work in connection with the samples from the Meat Inspection Division, resigned his post during the year.

Extension of Chemical Building.—The need of further laboratory accommodation has been keenly felt for some time past. It is therefore with pleasure that we can announce that work on the extension of the chemical building was commenced last November, which when finished will add four good-sized laboratories to the present suite, and much facilitate the work of the Division.

I have the honour to be, sir,
Your obedient servant,

FRANK T. SHUTT,
Dominion Chemist.

CONSERVATION OF SOIL-MOISTURE.

This important investigation was begun in 1910, with the object of ascertaining the influence of various cultural operations and croppings on the moisture-content of the soil. It comprises a series of cultural and rotation experiments conducted on the Experimental Farms at Brandon, Man., Indian Head, Sask., Rosthern and Scott, Sask., Lethbridge, Alta., planned and arranged to include a number of systems of tillage, soil management and crop rotation likely to prove suitable for farming in the open prairie districts enjoying but a sparse and irregular rainfall. Soil samples from the experimental plots have been taken at two depths, 0 to 18 inches and 18 inches to 5 feet, periodically throughout the season, and their moisture-content determined.

It will be understood that this work is still in progress and, therefore, that final conclusions must be deferred. It is possible, however, to indicate some of the more striking results that already have been obtained.

In 'Prairie Breaking,' the plots were ploughed from two to five inches deep. In two seasons of the three, the soil of the deeper ploughed plots, for the first eighteen inches, retained the more moisture. Though the difference usually was small, it was fairly well maintained throughout the summer, the surface of the plots having been kept well cultivated. It was found that adjacent plots of recently-broken land sown, after due and similar preparation by discing and harrowing, to a mixture of peas and oats and flax respectively, differed considerably in their moisture-content as the season advanced. That bearing the peas and oats was the more moist; probably owing to the greater protection against surface evaporation provided by the more leafy crop.

The influence on moisture-content of 'Depth and Time of Ploughing' was determined on a large number of plots. As regards depth, the ploughing varied from three to eight inches, with an additional subsoiling of four to six inches on certain of the plots. The times of ploughing were one month apart, in May, June and July. The trend of the results from two seasons' records is in the direction of greater moisture storage following the deeper ploughing, but evidently there is a limit—probably determined by the nature of the soil—beyond which the stirring of the soil by the

plough does not appreciably affect the moisture-content or, at all events, cannot be done profitably.

Earliness in ploughing has shown itself conducive to moisture storage in a most marked degree. The delay of a few weeks has resulted in a decidedly lower moisture-content throughout the rest of the season.

In 'Subsoil Packing' the data show a well-marked advantage for light and sandy loams, but indicate that there was little extra conservation of moisture from this operation on heavy clay loams.

THE INFLUENCE OF ENVIRONMENT ON THE COMPOSITION OF WHEAT.

This research, inaugurated in 1905 and continued since that date, has shown that soil and seasonable conditions may markedly affect the composition of wheat and barley. For the past three years, wheat from the same stock has been grown on the larger number of Experimental Farms and Stations from Prince Edward Island to British Columbia, and the harvested grain analyzed. The data obtained in 1912 in a very large measure confirm those of previous seasons from similar experiments conducted in the northwestern provinces only, and go to show that a moderately dry soil accompanied by high temperatures during the period in which the grain is filling. tend to arrest the vegetative growth of the plant, hasten maturity and conduce to a hard berry with a high percentage of gluten and high baking value. It would seem from this investigation that the excellent quality of northwestern grown wheat is due, in part at least, to climatic conditions prevailing during the latter summer months over large areas in the grain-growing districts and which bring about a quick maturation of the grain.

The results as regards protein (gluten) from the examination of the 1912 crop are of considerable interest in showing the variations that may occur in one season's growth at points across the Dominion.

PROTEIN in Marquis Wheat, Crop 1912 (calculated on water-free basis.)

Laboratory Number.	Locality grown.	Protein (N x 5·7)
11,209	Parent Seed, Indian Head, Sask., 1911	14·62
13,923	Charlottetown, P. E. I	12·50
13,162	Nappan, N. S	13·29
13,288	Cap Rouge, Que	14·96
13,008	Ottawa, Ont	16·81
13,173	Brandon, Man	17·21
13,146	Indian Head, Sask	17·02
13,596	Rosthern, Sask	17·17
13,174	Scott, Sask	18·10
13,939	Lethbridge, Alta., irrigated	16·32
12,842	" " non-irrigated	17·93
13,166	Lacombe, Alta	18·09
13,680	Agassiz, B. C	14·77

As an illustration of the principle we have cited, that available soil moisture influences the protein-content, attention may be directed to the data from Lethbridge, Alta. The soil on the non-irrigated plot was found to be from 2 per cent to 4 per cent drier during June, July and August than that of the irrigated plot, and the

wheat from the drier soil proved on analysis to be the richer in protein by 1·61 per cent.

Detailed discussion of these data in relation to climatic conditions prevailing during the growing season will be deferred until a further report, when additional results upon this interesting subject will afford a better ground for a final pronouncement.

FODDERS AND FEEDING STUFFS.

The nutritive value of the various feeds upon the market is a matter well worthy of study by the farmer and dairyman, and especially so in these days of high prices. Profit in feeding depends to a large extent upon economical buying of the 'concentrates' to supplement the home-grown feeds and fodders, and economical buying is not merely a matter of price. There are many high-priced feeds well worth the money asked for them, by reason of their richness in protein and fat; on the other hand, there are cheap feeds that are in reality very dear, simply because they contain little protein and fat and are overloaded with a superabundance of indigestible fibre. The farmer has necessarily familiarized himself with a number of feeds—such as bran and shorts—and feels himself fairly competent to decide as to the quality of any sample of such feeding stuff that may be offered him. But there are many by-products on the market to-day which cannot be judged simply from their appearance, or respecting which he has had no experience. For the value of these he must look to the chemist; in other words, he must know, approximately, their percentage of protein and fat and whether they contain little or much indigestible fibre. To furnish this information and at the same time protect the purchaser from fraud, the Commercial Feeding Stuffs Act was passed in 1908. This Act, under the operation of the Inland Revenue Department, requires that feeds offered for sale (with certain exceptions, such as bran, middlings, hay, straw, roots, the mixed or unmixed meals made directly from entire grain, and a few others) shall be duly registered and shall bear a label or statement attached to the package giving the registration number and a guaranteed analysis in terms of its minimum content of protein and fat and its maximum content of fibre. The enforcement of this Act has undoubtedly had a salutary effect in keeping many of the more worthless feeds off the market, but the educational value of the Act might be increased by a keener appreciation of its teachings on the part of those for whom it was passed. Every purchaser of a feeding stuff coming within the jurisdiction of the Act should see that the material bears a label or brand with registration number and guaranteed analysis inscribed thereon. He should then study the analysis, comparing it with that of other feeds that are available, so that he may be in a position, knowing their respective prices per ton, to make a judicious selection.

This official examination and control of feeding stuffs by the Inland Revenue Department has relieved the Experimental Farm laboratories of much analytical work; nevertheless, we still find it desirable from one reason or another to submit certain feeding materials to examination. During the year, the data given in the sub-joined table have been obtained. The feeds tabulated have been used in experimental stock feeding in the Central Farm, or are those respecting which information was specially desired.

Barley and oats.—Both of these cereals are highly esteemed for farm stock; oats finding their chief use in horse feeding, while barley is more commonly employed for dairy cows and swine. The average composition of the two grains may be given, for the purposes of comparison, though it should be pointed out that not only are both variable but that both are very susceptible as regards protein-content to climatic

influences, and in this respect resemble wheat. A hot and rather dry season during the filling out of the kernel tends to a small grain, rich in protein, whereas if this period be cool and wet the grain is larger and more starchy.

Average Composition of Barley and Oats.

	Moisture.	Protein.	Fat.	Carbo-hydrates.	Fibre.	Ash.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Barley....................	10·96	10·69	2·08	69·50	4·36	2·41
Oats....................	9·46	11·83	4·73	59·69	11·39	2·92

These averages are from analyses made a few years ago in the Farm laboratories, about twenty samples each of barley and oats, grown chiefly in different parts of Ontario, being examined. It will be observed that oats are rather richer in protein and in ash constituent and much richer in oil than barley; they, however, contain more fibre. Speaking broadly, ground barley would be mealier (due to a larger percentage of starch) but the ground oats would be the stronger and richer, though somewhat the more fibrous feed.

The two grains mixed and ground together make an excellent feeding material. Such a mixture (usually two parts of oats to one of barley) has long been used with much satisfaction in England and other Northern European countries, both for milk and pork production, and undoubtedly such a meal will be found equally valuable in Canadian feeding and more especially for dairy stock. The first four analyses of the table are from samples drawn at short periods from a meal made by grinding oats and barley in equal proportions and used on the Central Experimental Farm in an experiment in pig feeding. The results indicate that the mixing has been thorough, the differences between the different samples being very slight, and that a meal of a most desirable character has been produced. It has a protein-content between 11 and 12 per cent, largely digestible, and a comparatively low percentage of fibre, two features which, with its moderately loose and bulky character, should make it generally useful as a large component of the ration for several classes of farm stock.

Middlings and Feed Flour.—In the modern milling of wheat by the roller process, from 25 to 30 per cent of the grain appears as certain by-products of very considerable value as cattle feeds, viz., bran, shorts, middlings, and feed flour. Bran consists of the membranous coats of the wheat berry, together with the underlying 'aleurone' layer, which is especially rich in protein. Shorts and middlings are almost synoymous terms and contain more floury particles and less fibre than does bran. There appear to be several grades of these two latter feeds and it is not uncommon nowadays to find shorts to be merely a reground, fine bran, practically destitute of the mealiness that characterized the shorts of the old stone mills. Middlings will vary in appearance and composition according to the proportions of the fine bran particles and flour present. This by-product also occasionally contains the wheat germ, which is rich in protein and fat, but which is an undesirable ingredient in flour. Feed flour also known as 'red dog,' dark feeding flour, etc., is the lowest grade of flour, too dark for bread making but which has a high feeding value.

In the table of analyses presented, the composition of middlings and feed flour used in experimental pig feeding on the Central Farm, is given. In protein-content they are very similar and there is not much difference in fat, though the middlings are somewhat the richer. In fibre the middlings contain about four times the amount found in the feed flour and similarly in ash constituents (phosphate of lime) the

middlings contain the larger amount. In order to compare at a glance the composition of these by-products, we append the following averages from analyses made in the Farm laboratories.

AVERAGE Composition of Bran, Shorts, Middlings and Feed Flour.

—	Water.	Protein.	Fat.	Carbo-hydrates.	Fibre.	Ash.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Bran	11·07	14·52	4·37	54·19	10 14	5·71
Shorts	10·34	15·93	5·24	59·58	5·23	3·68
Middlings	12·14	16 96	3·79	56·14	6 71	4·26
Feed flour	12·19	18·11	2·94	63·45	1·48	1·83

Individual samples of all these by-products will naturally vary somewhat from these averages, but the above data show the main differences in composition between these feeding stuffs, and allow the farmer, with a knowledge of their market prices, to select those best suited to the requirements of his stock. Bran, for instance, by reason of its bulk, its protein and fat and good supply of ash constituents needed for milk production, has shown itself unexcelled for dairy cows, in feeds, for which the comparatively high fibre-content is not an undesirable feature. On the other hand, middlings are more suitable for young pigs, since these animals cannot digest the larger percentage of fibre in the coarser bran. In briefly referring to the nutritive value of feed flours, this by-product, though rich in protein and low in fibre, does not furnish bone-forming material (ash constituents) in the same proportion as bran and shorts and, as a consequence, cannot be used with success as largely as these feeds, for growing animals.

Shorts, Laboratory No. 13176—These were forwarded by the Western Canada Flour Mills, Brandon, Man. The analysis shows them to be of distinctly inferior quality, being low in protein and too high in fibre. The legal requirements for shorts are protein not less than 15 per cent, fat not less than 4 per cent, and fibre not more than 8 per cent.

Wheat by-product from the manufacture of a breakfast food, Laboratory No. 11077.—This feed is comparable with the best class of shorts, but is somewhat lower in moisture, fat and fibre. It should prove a nutritious feeding stuff of merit and of especial value in the meal mixture where it is desirable to keep down the fibre-content, as in pig feeding.

Rice Meal, Laboratory No. 11354.—A finely-ground meal, sound and free from rancidity. Evidently a palatable, nutritious feed. The data indicate that in protein and fat it is somewhat above the average of rice meals imported into the United States.

Rice Meal, No. 13715.—This meal was purchased in Vancouver, B.C., and used on the Experimental Farm, Agassiz, B.C., in a pig-feeding trial. Though of satisfactory quality it is not quite equal in protein and fat to the better brands of rice meal on the market.

Rice meal, when of good quality and free from rancidity, is considered an excellent feed for dairy stock and in pig feeding. It is somewhat variable in composition, but the protein in samples of average quality is about 12 per cent, fat 13·0 per cent, and fibre not more than 6·0 per cent.

Oats, Laboratory Nos. 11526-7.—These are from the crop of 1911, grown in Alberta and graded as 'Extra Feed' and 'No. 1 Feed,' respectively. They were forwarded to the laboratory and analyzed in May, 1912. Extra feed weighed 38 pounds per bushel; No. 1 Feed 34 pounds. The analysis was made to learn if these oats contained an excessive amount of moisture (as was reported) and to ascertain what differences there might be between the two grades as to nutritive value.

The moisture-content of the cereals depends not only on their ripeness when threshed, but also on the conditions under which they have been subsequently stored. Thus, not infrequently we have found fully-ripened wheat to lose from 2 to 4 per cent moisture on storage for a few weeks in the winter season in cotton bags stacked in the warm dry air of the chemical building at Ottawa. Much of this may be regained during the following summer, when the air is more moist than in the winter. The present samples have a somewhat higher moisture-content than is usually met with in oats on the market, but the amount is not excessive, and we are inclined, from the appearance of the grain and certain other considerations, to attribute it to the grain not being thoroughly ripe when threshed.

The proportion of hull to kernel is an important consideration, for the hull has a very low feeding value. This fact was well brought out in our work on the Banner oat, published in the Annual Report of this Division for 1903. The data for the present samples, together with those from Banner oats grown on the Central Experimental Farm, 1902, inserted for comparison, are as follows:—

	Kernels. Per cent.	Hulls. Per cent.
Extra Feed, Alberta, 1911	69·84	30·16
No. 1 Feed, Alberta, 1911	65·77	33·23
Banner, C.E.F., 1902	71·92	28·08

These results clearly indicate the superior quality of the grade Extra Feed, as compared with No. 1 Feed, though evidently it is not equal to the sample of Banner oats previously examined.

The protein and fibre data confirm the statement as to the relative feeding value of these two grades; Extra Feed contains 1 per cent more protein and 1.21 per cent less fibre. The slightly higher percentage of ash in No. 1 Feed indicates a larger proportion of hull.

The weight of 1,000 kernels of oats of Extra Feed was 29·14 grams, that for No. 1 Feed, 27·96 grams. These results follow the respective weights per bushel and serve to support the contention that the heavier oat contains the larger proportion of kernel and has the greater feeding value.

Oats, slightly damaged, Laboratory No. 12074.—A correspondent in Castor, wrote us in June, 1912, 'As doubtless you know, the West this year has thousands of bushels of damaged oats and we in this neighbourhood would feel obliged if you would inform us as to their feeding value. If useful for cattle feed we would obtain cattle for feeding next winter. A representative sample is sent herewith.'

These oats, as received, had a somewhat damaged appearance and were considerably discoloured, but they were not damp nor were there appearances of mould.

The data indicate that there has not been such an impairment as to render them useless as feed, though they are from 2 to 3 per cent lower in protein than well-matured, sound oats. A further feature lowering the feeding value, as compared with first-class oats, is the higher fibre-content, due to the larger proportion of hull. Their feeding value would probably be about three-fourths that of good quality oats. Provided these damaged oats were dried before any fermentation had taken place or mould appeared, they should prove suitable for cattle feeding.

In the report of this Division for 1908, we give the analysis of a sample of 'frozen oats,' the feeding value of which was distinctly inferior to those now reported on. No doubt the stage of development of the grain when caught by the frost would determine very largely its quality.

Distillery Grains, Laboratory No. 11164.—Dried distillery grains are a concentrate of high feeding value and have been used to advantage, more especially in milk production. The composition of the 'grains' will depend somewhat on the nature of the cereals used in the manufacture of the 'spirit,' the protein in the kiln-dried product varying from 24 to 32 per cent, and the fat between 9 per cent and 12 per cent. This large variation renders it desirable to purchase only on guaranteed analysis. As a class dried distillery grains are richer both in protein and fat than dried brewers' grains and, being both palatable and digestible, constitute one of the best feeds on the market.

Dried Brewers' Grains, Laboratory No. 13827.—Forwarded by a correspondent at Ste. Anne de Bellevue, Que., and stated to be from Molson's Brewery, Montreal.

Dried Brewers' Grains, No. 13903.—Sent in by a correspondent at Sherbrooke. Que., and stated to be a product of a local brewery.

Both are of good quality, though No. 13827 is somewhat superior by reason of its higher protein-content.

The average composition of this feed, as given by American authorities, is as follows:—

Analysis of Brewers' Grains.

	Per cent.
Water	8·2
Protein	19·9
Fat	5·6
Carbohydrates	51·7
Fibre	11·0
Ash	3·6

Dried brewers' grains rank high as a concentrated feed, being rich in protein and moderately rich in fat, palatable and fairly digestible. Its use has been chiefly for dairy cows, for which it is considered an excellent and desirable feeding stuff.

Bean Meal, Laboratory No. 11251.—This is a coarse brown meal with an odour of locust bean. It was obtained through H. M. Fowlds & Son, Toronto, and is stated to be ground from a bean imported from Palestine, and sold at $25.00 per ton.

This is not a feeding stuff with which there has been much experience in Canada. In European countries bean meals have long occupied an important place among the more nitrogenous concentrates. The present sample would appear to be of fair quality as regards protein and fat, but the very high percentage of ash seems to point to the presence of dirt from sweepings or other source. Bean meal, free from foreign matter, and sound, is a feeding stuff of considerable merit, by reason of its high protein-content. Some bean meals possess a bitter taste that renders them unpalatable to stock; on the other hand, many have a sweet and nutty flavour, and are highly relished.

Ground Flax, Laboratory No. 12849.—The percentage of protein and oil found are considerably lower than those stated to be present. From the analysis of the seed of a number of varieties in 1910, we obtained an average protein-content of 24·77 per cent, oil 37·10 per cent, but 'ground flax' as found on the market would be considered of good quality if it contained 21 to 22 per cent protein and 30 to 33 per cent

oil. It is not a feed that is used on the farm save for calves (for which, in conjunction with skim milk, it is highly esteemed), but linseed oil cake and oil meal, resulting from the expression of the greater part of the oil from the flax seed, are feeds of the very highest order for bringing up the proportion of protein and fat in the ration, for both milk and beef production.

Tankage. Laboratory No. 11250.—This is a by-product from an abattoir. As received, it was a fine, dry powder of a dark-brown colour with the characteristic and unpleasant smell of tankage and similar products. The percentage of protein and fat are very fairly satisfactory for materials of this class: protein nearly, 60 per cent, fat almost 10 per cent, but, except in a limited way, in connection with pig and poultry feeding, it is doubtful if tankage can be used to advantage as a food on the farm; cattle and sheep find it unpalatable and generally refuse to eat it. It is a feed which readily spoils, especially in warm, damp weather. From difficulty in learning the nature and condition of the materials used in its manufacture, it is not a feed to be generally recommended.

Molassine Meal, No. 13947. This feeding stuff is manufactured by the Molassine Co., Ltd., London, England. It is prepared from crude molasses and peat or moss—the latter constituent acting simply as an absorbent and not adding to the nutritive value of the material though counteracting, it is claimed, the tendency to 'looseness' frequently induced when molasses alone is fed. This 'meal' is in the form of a loosely-held-together mass, brownish-black, slightly moist and sticky, but readily crumbling on handling.

The constituent of importance is sugar, of which there is 39·12 per cent present in the sample examined.

Considered solely from the point of view of their food value, molasses feeds in general may be regarded simply as furnishing sugar, of which they usually contain about 50 per cent. Sugar has a high value in the animal economy, as a source of heat and energy and in the formation of fat. Its ready solubility, and the ease with which it is digested and assimilated, gives sugar a high place among the carbohydrates for these purposes. Apart from their direct food value, the molasses feeds are stated to act beneficially in stimulating the appetite, increasing digestion, and in keeping the animal in a thrifty condition.

Molasses feeds cannot be used to supply deficiencies in protein and fat and, therefore, are not in the same class as those concentrates which are solely used to enrich the ration in these constituents. In most of them, the percentage of digestible protein and fat is extremely small and may be disregarded. They are extremely palatable and highly relished by cattle, but it is doubtful if they can be economically employed in the ration beyond one-fifth to one-third of the whole, not merely by reason of their poverty in protein and fat, but from the prices at which they are sold, namely, $20 to $38 per ton, which can scarcely be justified simply on the grounds of food value.

Molascuit, Laboratory No. 13869.—This is a product made in Demerara, British Guiana, from sugar cane fibre or pith (sugar cane from which the sugar has been expressed and subsequently disintegrated) and molasses. The former is very absorbent and constitutes an excellent medium for holding the molasses and presenting it in a convenient form for feeding; it, however, does not contribute in any appreciable degree to the nutritiousness of the mixture. In appearance this feed is brown and fibrous (not unlike certain varieties of peat, but not quite so loose in character) and slightly sticky. It has the smell of the coarser, unrefined grades of molasses.

As regards protein and fat its value is negligible: its feeding properties are dependent upon the sugars present, of which, in the sample analyzed, there was present 43·70 per cent.

Herb Spice, Laboratory No. 11225.—Manufactured by the Durham Cattle Food Co., Durham, N.H. The sample analyzed (in original container) was sent by a correspondent in Morton, Ont., who states that it is retailed at $3.50 per 25 pounds. The data would indicate that it has a fairly high feeding value but do not allow of any pronouncement as to its condimental or medicinal properties.

In the compounding of this class of feeds, known as condimental foods, condition powders, stock foods, etc., etc., a variety of ingredients are used. The basis may be bran, wheat refuse and screenings, linseed meal, cotton seed meal and milling by-products of various kinds and values. According to the nature of the feed basis so will the percentage of protein, fat and fibre be; some of these preparations do not contain more than 10 to 12 per cent protein, while others of a richer character contain more than 30 per cent. To the feed basis certain chemicals and drugs in varying proportions are added. These are all low-priced materials and comprise salt, sulphate of iron, charcoal, sulphur, saltpetre. gentian root, fenugreek, aniseed, coriander and licorice and possibly other spices of a somewhat similar character. These chemicals and spices, it is held, impart certain medicinal properties to the preparation, acting as tonics, appetizers, regulators, etc., etc.

Our main contention with regard to these 'condimental foods' is that the prices charged are far in excess of their value. All the ingredients used are low-priced, most of them worth from 3 to 5 cents per pound, and none of them more than 10 cents per pound. The feeds could be compounded, if desired, at home for a fraction of the price generally asked for the proprietary article. Secondly, we contend that if the animals require medicine it would be cheaper and better from every point of view for the farmer to purchase at the drug store what he wants and to treat the animals according to their ailment, or, if the matter is one requiring professional skill and knowledge, to procure the services of a veterinary surgeon. With good and nutritious feeds and their judicious use, there should be little need of condimental preparations, as in cases of serious illness, as we have said, the ailment should be specially treated.

Corn Ensilage, Laboratory No. 13279.—This ensilage, forwarded from Alvinston, Ont., had been made from 'White Cap' dent corn. As received it was very dry and of a pale-yellow colour; evidently the corn had been cut when fairly ripe, and later than is customary for the silo. It was pleasantly aromatic and showed a fair amount of cob and kernel. By reason of its low water-content (the percentage of water in ensilage is usually between 70 and 80 per cent), the protein, carbo-hydrates and fibre are somewhat higher than the average. Considering all the data and its excellent condition, it may be assumed to be fully equal to average quality ensilage—the slightly higher fibre content being offset by the larger amount of protein present. It was reported that the cattle ate it readily, with little waste.

Corn Ensilage, Laboratory No. 13686.—From St. Janvier, Que. The particulars accompanying this sample are, briefly, as follows: The corn was quite green when cut and contained very few cobs. The kernels appeared to be in the early milk stage. The ensilage, as received, was in good condition and sweet. The data indicate that the crop was decidely immature when harvested. As a result, the ensilage is watery and of a lower food value than that cut at a more advanced stage of growth. Its dry matter content is 14·31 per cent, whereas that of ensilage from corn ensiled at the right stage of growth (seed 'glazing' and lower leaves turning yellow) is not less than 21·0 per cent. Similarly the protein, the chief nutrient, is considerably less than an ensilage of good quality.

Clover Ensilage, No. 13757.—Forwarded from the Experimental Farm Agassiz, B.C. As received it was essentially clover stems, the percentage of leaves being very

small. There was present a certain admixture of straw. This was from first crop clover cut about the end of June, 1912, and at once placed in the silo. In September the remaining space in the silo was filled with corn. The underlying clover ensilage may have become more or less saturated with juice from the corn. It was reported as unpalatable to dairy cattle. The data are in general accord with those for clover ensilage and indicate average quality. In this respect this sample differs markedly from the clover ensilage made on this Farm (Agassiz, B.C.) in 1910, and analyzed last year (*vide* page 149, Annual Report, 1912), and which was found to be exceptionally rich in protein.

Oat Hay, Laboratory No. 13924.—This sample was grown at Lacombe, Alta., on land seeded to oats and peas, but the proportion of the latter that grew was so small that the harvested product might be considered as 'straight oats.' The crop was cut green, the kernels being in the milk, shocked and stacked when dried.

The data, with the exception of those for protein, are in fair accord with those previously obtained for oat hay; the percentage of protein is somewhat lower than that usually found in this class of roughage. It compares very favourably with well-cured hay from mixed grasses, but could scarcely be considered as more nutritious. It would no doubt be found a palatable roughage.

Teff Grass Hay, Laboratory No. 13362.—Teff *(Eragrostis Abyssinica)* is an annual grass with small seeds used for making bread in certain parts of Africa. It has been grown in the Southern States as a source of hay, of which it is stated to yield a heavy crop of fine quality.

The sample analyzed was collected at Bank Head, Okanagan District, B.C., and was said to have yielded a good crop. The hay was about three feet, and apparently very ripe and strawy. It was harsh and brittle and gave the impression of being too mature for profitable use as a fodder. The seed had been threshed out. The analytical data indicate a material of exceedingly low feeding value, and decidedly inferior in nutritive properties to many straws. If cut at an earlier stage of growth it would have yielded a better quality hay, but it is very doubtful if the plant is worth cultivating for forage purposes.

ANALYSIS of Feeding Stuffs—1912-13.

Laboratory Number.	Name.	Particulars.	Water.	Crude protein.	Oil or fat.	Carbo-hydrates.	Fibre.	Ash.
			p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
13871	Barley and oats	Ground in equal proportions, C. E. F	14·31	11·90	2·17	63·30	5·58	2·71
13873	"	" "	14·73	11·57	1·58	63·14	6·25	2·73
13874	"	" "	14·56	11·95	1·50	63·95	5·44	2·60
13877	"	" "	13·68	12·00	1·55	63·76	5·77	3·24
13872	Middlings	Maple Leaf Milling Co	12·60	16·59	3·61	56·10	6·58	4·52
13875	"	"	12·02	17·55	3·53	56·46	6·36	4·08
13880	"	"	12·07	16·97	4·30	55·46	6·97	4·23
13881	"	"	11·99	16·74	3·72	56·44	6·91	4·20
13870	Feed flour "Ideal"	"	12·56	18·67	3·21	62·10	1·51	1·95
13876	"	"	12·56	17·82	2·29	64·11	1·40	1·82
13878	"	"	12·07	17·95	3·25	63·55	1·45	1·73
13879	"	"	11·59	17·99	3·00	64·06	1·55	1·81
13176	Shorts	Western Canada Flour Mills	8·37	12·71	3·92	57·35	13·38	4·27
11077	Feed—Wheat by-product	McKellar Grain Co	4·63	16·19	2·48	72·39	2·49	1·82
11354	Rice meal	Purchased in Vancouver, B.C	11·65	13·00	15·50	39·82	8·85	11·18
13715	"	" "	10·54	11·44	11·25	53·36	6·13	7·28
11526	Oats	"Extra Feed," Lacombe, Alta	13·82	10·77	4·60	58·06	9·82	2·93
11527	"	"No. 1 Feed" "	14·02	9·78	4·82	57·24	11·03	3·11
12674	"	Slighty damaged, Castor, Alta	11·24	9·01	4·87	61·03	10·38	3·47
11164	Distillery grains	"Ajax Feed," Macdonald College, Que	4·50	26·52	12·60	38·49	15·29	2·60
13903	Dried brewery grains	Fletcher Pulp & Lumber Co., Sherbrooke, Que	8·17	18·11	4·51	51·84	13·49	3·88
13827	"	Ste Anne de Bellevue, Que	8·10	21·10	4·14	48·43	13·83	4·40
11251	Palestine bean meal	H—A. Co., Toronto	13·36	27·68	4·47	36·35	4·72	13·42
12849	Flax meal	J. O. M., St. Catherines, Ont	....	20·16	26·34	....	....	....
11250	Tankage	H—A. Co., Toronto	6·49	58·50	9·80	....	4·15	20·95
13947	Molassine meal	Imported from London, England	21·45	8·44	0·35	56·29	5·40	8·07
13869	Molascuit meal	Imported from Demerara, British Guiana	16·10	2·81	0·20	66·23	6·97	7·69
11225	Herb spice	Durham Cattle Food Co., Durham, N.H.	8·56	31·05	8·76	36·98	8·79	5·86
13279	Corn ensilage	Alvinston, Ont	63·72	3·15	0·87	20·40	7·15	1·56
13686	"	St. Janvier, Que	85·69	1·44	0·08	7·21	4·01	1·57
13757	Clover ensilage	Experimental Farm, Agassiz, B.C	78·16	2·70	0·28	9·63	7·49	1·74
13924	Oat hay	" Lacombe, Alta	6·27	6·18	1·54	53·83	26·07	6·11
13662	Teff grass hay	Okanagan, B.C	4·67	2·44	1·22	56·67	28·23	6·77

THE RELATIVE VALUE OF FIELD ROOTS.

MANGELS.

Farmers in making selection of the variety of field roots to sow, usually take into consideration yield and keeping quality in storage, but neglect to acquaint themselves with the relative feeding properties of the different varieties offered for sale. This latter is an important point, especially as regards mangels, the chief root crop in many sections. Our investigation, carried on season by season for the past eight years, has shown wide differences in dry matter and sugar-content between the varieties examined—differences in some cases amounting to almost 100 per cent. It is not claimed that the whole value of mangels in the ration is determined by their nutritive properties as measured by the percentage of their nutrients. Undoubtedly their succulency, their palatability, their entire digestibility, in addition to their medicinal properties, give them an enhanced value in the well-balanced ration. Nevertheless, since all varieties contribute alike in these respects, we may safely conclude that those possessing high percentages of the nutrients will be more valuable as food than varieties less rich. It is this consideration that leads us to direct the attention of the farmer to the results of 1912, presented in the following table.

Twenty-three varieties of mangels, grown on the Central Experimental Farm, Ottawa, were submitted to analysis. The larger number of these are well-known mangels and have appeared in the series for a number of years. It is not claimed that these are all distinct varieties or sorts; seedsmen are apt to rename for the purposes of advertisement, old and well-known strains, and this has led, no doubt, in some cases to duplication of the same variety in the series. Unfortunately, there is no way of eliminating this duplication, nor indeed of recognizing it, with certainty, when it does occur. We do know that in some cases, though it is not admitted by seedsmen, the same variety is put out under two or more names, and this necessarily has led to confusion in a critical study of our data. It is quite possible, of course, for these to be an improved strain of an old and well-known variety, and giving such a distinct name has some justification.

In the table that follows, the varieties have been placed in the order of their richness in dry matter. In a general way, but not universally, the sugar-content bears a relation to the dry matter. As sugar is the most important nutrient in this class of foods, its percentage has been determined and recorded in the table. The average weight of root, which, as a rule, bears a fairly constant ratio to the yield per acre, is also given.

ANALYSIS of Mangels, Central Experimental Farm, Ottawa, Ont, 1912.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p.c.	p.c.	p.c.	Lb.	Oz.
Giant White Half Sugar	86·62	13·38	7·50	2	6
Giant Intermediate Sugar	86·86	13·14	9·15	1	15
Mammoth Long Red	87·00	13·00	8·58	2	9
" "	87·35	12·65	7·31	3	3
Giant Yellow Intermediate	87·80	12·20	6·82	3	3
Prize Mammoth Long Red	87·92	12·08	8·01	3	0
2345 Half Sugar	88·15	11·85	7·62	2	9
2194 Mammoth Long Red	88·48	11·52	6·25	3	1
Golden Tankard	88·82	11·18	6·33	2	10
Selected Perfection	88·87	11·13	6·94	3	9
2191 Barres Long Yellow	89·50	10·50	5·65	1	15
2192 Yellow Half Long	89·98	10·02	5·65	2	5
Giant White Half Sugar	90·21	9·79	7·12	2	9
Danish Taaroje	90·51	9·49	6·24	3	4
Giant Yellow Oval	90·57	9·43	5·76	3	1
Giant Yellow Intermediate	90·82	9·18	6·33	3	2
Gate Post	91·02	8·98	5·05	3	5
2193 Red Echendorfer	91·39	8·61	4·65	2	8
Selected Yellow Globe	91·58	8·42	5·66	1	12
Selected Giant Yellow Globe	91·69	8·31	6·44	3	1
Windsor Yellow Globe	91·92	8·08	5·16	4	5
Danish Siudstrup	91·93	8·07	4·93	3	4
Giant Yellow Globe	92·13	7·87	4·75	3	2

Comparing the extremes of this series, we note a vast difference in nutritive value. The difference in dry matter is 5·51 per cent, and in sugar 4·40 per cent, and it would not be far from the truth to conclude that, weight for weight, the richest of the series, considered from the feeding standpoint, is worth almost twice as much as the poorest. These results are in close accord with those of previous seasons and emphasize the importance of this inquiry to the farmer who is seeking to improve the quality and value of his crops.

A study of the following table allows a comparison of the averages of past seasons.

MANGELS.—Yield and Average Composition, 1904-1912.

Year.	Number of varieties analyzed.	Average Weight of One Root.		Yield per acre.		Dry matter.	Sugar.
		Lb.	Oz.	Tons.	Lb.	Per cent.	Per cent.
1904	10	2	11	30	1,277	11·69	6·62
1905	17	3	9	39	369	10·04	4·67
1906	16	2	7	31	159	11·63	5·93
1907	10	2	11	27	689	12·64	7·46
1908	12	2	2	23	690	11·87	5·33
1909	14	3	5	28	920	11·21	6·21
1910	8	5	10	56	57	10·04	4·46
1912	23	2	9	29	61	9·51	6·43
Average for eight years						11·08	5·89

Although the percentage of dry matter in the 1912 mangels is below the average, due no doubt to the inclusion in the series of a larger number than usual of rather-

poor varieties, the sugar content is very satisfactory as compared with that of past years. The data for average weight of one root and yield are those of a normal crop and indicate a season suitable to the growth of a well-developed but not too large a root, that was well matured before harvesting.

INFLUENCE OF HEREDITY IN MANGELS.

In this inquiry commenced in 1900, two well-known mangels, Gate Post and Giant Yellow Globe have been used, and the results of the thirteen seasons form an exceedingly interesting series for comparing the relative value of these varieties. Reference has been made to the fact that large differences in composition exist among the varieties of mangels, and to the further fact that the varieties fell generally into the same order, season by season, when considering their dry-matter-content, indicating that *quality* might be inherited and to a certain degree independent of seasonal influences. To obtain specific data on this point, which would mean that a certain character as regards composition is transmitted, the two varieties mentioned above were chosen, as these, from a preliminary analysis, seemed to be typical of the richer and poorer classes of mangels. They have been grown side by side, year by year, on the same soil and with the same culture—and, therefore, necessarily under the same climatic conditions. Differences in composition, as well as in other matters, must, under such circumstances, be very largely due to inherited qualities. The data for the thirteen seasons are as follows:—

Dry Matter and Sugar in Gate Post and Giant Yellow Globe Mangels.

Season of Growth.	Gate Post.				Giant Yellow Globe.			
	Average Weight of One Root.		Dry Matter.	Sugar in Juice.	Average Weight of One Root.		Dry Matter.	Sugar in Juice.
	Lb.	Oz.	Per cent.	Per cent.	Lb.	Oz.	Per cent.	Per cent.
1900	....	....	11·14	6·15	....	....	8·19	2·64
1901	2	9	9·41	4·15	3	3	9·10	4·08
1902	3	2	13·90	9·39	3	9	10·24	5·24
1903	3	3	12·93	7·38	3	13	10·89	6·17
1904	2	14	12·64	7·62	2	13	9·24	5·26
1605	2	13	12·07	6·83	3	12	8·64	3·55
1906	2	2	12·90	6·59	1	8	12·73	6·45
1907	3	10	12·53	7·25	2	7	10·78	6·34
1903	1	11	12·02	4·94	2	4	10·66	4·47
1909	3	14	11·82	6·64	2	7	10·95	5·82
1910	6	8	9·59	4·26	6	13	7·80	2·74
1911	2	11	10·04	3·86	3	1	6·66	1·85
1912	3	5	8·98	5 05	3	2	7·87	4·75
Average for 13 years.	....	....	11·53	6·16	....	....	9·52	4·56

It is significant that the Gate Post has always proved the superior root, though the differences between the two varieties have not been constant. Considering the averages for the experimental period, we learn that the Gate Post would contain about 22 per cent more dry matter and almost 35 per cent more sugar, than the Giant Yellow Globe. This denotes a very considerable difference in feeding value.

It has long been recognized that conditions of soil, culture and season may markedly affect the size and quality of root, but it would seem from this work that

there is an additional factor to be taken into consideration, and that heredity also has an influence in determining the composition of mangels.

TURNIPS.

Nineteen varieties of turnips grown on the Central Farm last season have been analyzed and the results recorded in the subjoined table in order of their dry-matter-content.

ANALYSIS of Turnips, Central Experimental Farm, Ottawa, Ont., 1912.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p.c.	p.c.	p.c.	Lb.	Oz.
Carter's Prize Winner	89.45	10.55	1.23	3	13
Hartley's Bronze Top	89.73	10.27	1.21	4	1
Kangaroo	89.85	10.15	.91	4	1
Best of All	90.06	9.94	.20	3	12
Halewood's Bronze Top	90.10	9.90	1.21	4	0
Carter's Elephant	90.39	9.61	1.31	3	14
Magnum Bonum	90.45	9.55	1.31	4	0
Hall's Westbury	90.54	9.46	.90	2	14
Perfection	90.56	9.44	1.82	3	6
Jumbo	90.63	9.37	1.01	4	1
Skirvings	90.67	9.33	1.21	5	6
Elephant	91.45	8.55	.91	4	1
Good Luck	91.75	8.25	1.25	3	14
Bangholm	92.70	7.30	1.21	3	5
Selected Purple Top (Westbury)	92.80	7.20	1.21	3	9
2195, Bangholm	92.93	7.07	1.01	4	1
2197, Funen Bortfelder	93.60	6.40	1.02	3	4
Mammoth Clyde	93.80	6.20	1.01	3	3
2196, Tankard	94.15	5.85	1.01	4	6

It will be observed that very considerable differences occur as regards dry matter but that, unlike as is the case with mangels, the sugar-content is fairly constant. We do not consider that the value of turnips to the practical feeder would be measured directly by the percentage of dry matter present, but there can be no doubt, with data such as the foregoing as the result of one season's crop, that very considerable differences in nutritive value do exist among the many varieties found on the market.

In the following tabular scheme the averages obtained since 1905 are presented.

TURNIPS.—Average Composition, 1905-1912.

Year.	Number of Varieties Analyzed.	Average Weight of one Root.		Yield per Acre.		Dry Matter.	Sugar.
		Lb.	Oz.	Tons.	Lb.	p. c.	p. c.
1905	20	2	13	30	1,060	10·09	1·10
1906	20	1	10	15	1,890	12·18	1·78
1907	14	3	5	33	142	10·14	1·11
1908	13	3	12	27	1,033	9·87	1·52
1909	13	2	10	29	542	11·30	1·43
1910	10	3	11	31	565	10·87	1·07
1912	19	3	12	33	155	8·65	1 10
Average for 7 years	....	....		....		10·44	1·30

It is held by many that size is an infallible guide to quality, the heavier the root the more nutritious it is—that is, the higher the percentage of dry matter. This may be true when comparing individuals of the same variety, but our results do not bear out that contention when comparing varieties.

CARROTS.

The more important varieties commonly grown are included in those now reported on. The results generally are very good, two of the six varieties examined containing more than 11 per cent of dry matter, indicating that seasonal conditions were favourable to this crop. Mammoth White Intermediate and White Belgian, as in 1910, contain least dry matter though quite up to the average in sugar-content. Between the first and the last of the series the difference in dry matter is somewhat less than 2 per cent, but in sugar-content the greatest difference is 1 per cent.

ANALYSIS of Carrots, Central Experimental Farm, Ottawa, Ont., 1912.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p.c.	p.c.	p.c.	Lb.	Oz.
Giant White Vosges	88·55	11·45	2·83	1	1
Half Long Chantenay	88·60	11·40	2·73	–	15
Chantenay	89·13	10·87	2·92	1	1
Ontario Champion	90·00	10·00	1·92	1	4
Mammoth White Intermediate	90·33	9·67	2·65	1	4
White Belgian	90 37	9·63	2·22	1	5

The averages for the past seven years are as follows:—

CARROTS.—Average Composition, 1905-1912.

Year.	Number of Varieties Analyzed.	Average Weight of One Root.		Yield per Acre.		Dry Matter.	Sugar.
		Lb.	Oz.	Tons	Lb.	p.c.	p.c.
1905	11	1	3	25	1,510	10·25	2·52
1906	10	1	2	19	1,605	10·59	3·36
1907	6	1	1	24	1,517	10·30	3·02
1908	6	1	3	22	133	10·89	3·34
1909	6	1	0	17	1,680	10·40	2·30
1910	5	1	9	34	1,640	10·17	3·23
1912	6	1	1	18	545	10·50	2·54
Average for 7 years						10·44	2·90

It is interesting to note from these yearly averages that this crop, from season to season, varies but very slightly as to composition—and this is particularly true of the dry matter-content. We do not find those fluctuations due to seasonal conditions observable in other farm roots.

SUGAR BEETS FOR FACTORY PURPOSES.

This investigation, instituted some years ago to ascertain the suitability of different parts of the Dominion to the growth of sugar beets satisfactory for sugar extraction, has been continued, seed from three leading varieties having been sown on nine of the Dominion Experimental Farms and Stations, and the products analyzed.

The varieties used in the test were Vilmorin's Improved A, Vilmorin's Improved B, and Klein Wanzleben, the seed being obtained from the well-known house of seedsmen and plant breeders, Messrs. Vilmorin, Andrieux et Cie., Paris, France, who have, by their skilful and painstaking work, accomplished so much in recent years in the improvement of the sugar beet.

Although these specially bred and selected varieties are nöted for their high sugar-content and possess undoubtedly in a marked degree the property or quality of withstanding conditions conducive to their deterioration, they, in common with all varieties, are susceptible to some extent to conditions of season, soil and culture. It is, therefore, not surprising that considerable differences should be found when examining the products grown at so many and widely distant points as have been included in this trial. A survey, however, of the whole series shows results remarkably satisfactory; in the larger number of instances, the beets were exceptionally good and in one or two cases only would the roots be accounted too poor for profitable sugar extraction. From the fact that the present data are strongly supported by those of previous years, it would seem that beets eminently suited for factory purposes, both as to richness and purity, can be grown in many parts of Canada. The manufacture of beet root sugar is at the present time carried on at two points in the Dominion—the one in western Ontario, the other in Alberta—and the beets used in both establishments are, we understand, of a satisfactory character. Our results go to show that beets of equally good quality could be grown in many other districts.

SUGAR Beets grown on the Dominion Experimental Farms, 1912.

Variety.	Locality.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Coefficient of Purity.	Average Weight of One Root. Lb.	Oz.	Yield per Acre. Tons.	Lb.
Vilmorin's Improved A	Charlottetown, P.E.I.	17·45	18·43	94·6	1	2	10	1,516
	Nappan, N.S.	13·49	14·43	93·5	..	14	..	..
	Cap Rouge, Que.	14·92	17·30	86·2	..	3	1	1,052
	Ottawa, Ont.	16·99	17·83	95·3	1	15	16	1,510
	Brandon, Man.	14·54	17·97	80·9	2	9	14	1,700
	Indian Head, Sask.	15·52	18·89	82·1	..	14	15	624
	Rosthern, Sask.	15·51	18·50	83.8	1	15	20	766
	Lethbridge, Alta., (irrigated).	19·42	21·57	90·0	1	8	16	909
	" (non-irrigated)	17·26	20·69	83·4	1	0	13	228
	Agassiz, B.C.	18·18	18·60	97·7	1	6	13	664
Vilmorin's Improved B.	Charlottetown, P.E.I.	11·40	13·26	85·9	1	3	10	460
	Nappan, N.S.	17·21	19·31	89·1	..	14	..	..
	Cap Rouge, Que.	14·94	18·40	81·2	..	2	..	1,155
	Ottawa, Ont.	17·64	18·83	93·7	1	5	16	340
	Brandon, Man.	14·06	17·60	79·8	2	13	16	1,220
	Indian Head, Sask.	16·69	19·57	85·3	1	5	11	1,232
	Rosthern, Sask.	14.69	17·06	86.1	1	15	20	1,560
	Lethbridge, Alta., (irrigated).	17·85	21·03	84·9	1	8	15	900
	" (non-irrigated)	17·83	20·63	86·9	1	2	10	999
	Agassiz, B.C.	17·03	18·00	95·1	1	7	14	512
Raymond A, ...	Lethbridge, Alta., (irrigated).	15·84	19·00	83·3	2	1	16	1,000
	" (non-irrigated)	17.56	20·43	85·9	1	6	12	1,300
Raymond B	Lethbridge, Alta., (irrigated).	16·25	18.80	86·5	1	14	9	1,720
	" (non-irrigated)	17·84	20.43	87·3	1	9	13	565
Klein Wanzleben.	Charlottetown, P.E.I.	17·59	19·30	91.1	1	9	10	1,648
	Nappan, N.S.	18·53	20·50	90·4	..	11	13	700
	Cap Rouge, Que.	14·89	18·17	81·9	..	3	1	1,465
	Ottawa, Ont.	18·15	19·43	93·4	1	4	15	85
	Brandon, Man.	11·61	14·37	80·8	2	12	19	1,160
	Indian Head, Sask.	15·14	18·03	83·9	..	14	12	288
	Rosthern, Sask.	13·68	16·66	82·1	2	2	18	880
	Lethbridge, Alta., (irrigated).	17·68	19·63	90·0	1	6	17	500
	" (non-irrigated)	17·92	20·43	87·6	1	7	11	1,613
	Agassiz, B.C.	19·40	20·40	95·1	1	8	16	1,264
Très Riche.	Nappan, N.S.	15·97	18·06	88.4	..	11	6	200
Vilmorin's Improved.........	"	18·19	18·86	96·5	..	13	5	100
Très Riche... ...	Charlottetown, P.E.I.	14·81	15·59	95·0	1	14	12	24
"	Agassiz, B.C.	15·51	17·15	90·4	1	5	15	96
Vilmorin's Improved	"	17·91	19·40	92·3	1	5	14	1,568

At Charlottetown, P.E.I., although the season was reported as generally unfavourable, being very dry for a considerable period following the seeding and with little sunshine during August and September, two of the varieties gave excellent results, both as to sugar-content and purity. The average from the three varieties is not equal to that of 1911, but, as will be seen from the subjoined table, it compares very favourably with those from other Farms and Stations. The soil is a sandy loam.

The roots from Vilmorin's Improved B, for some reason not apparent, showed a decidedly low sugar-content and coefficient of purity.

The season at Nappan, N.S., opened with a cold, late spring and was decidedly wet throughout the summer. However, in spite of these somewhat untoward conditions, two of the varieties produced very rich roots and the average from the three must be considered as excellent. The average weight of root was somewhat less than usual, which may have been due to seasonal conditions. The soil was a clay loam.

At Cap Rouge, Que., the season was very bad, an early drought being followed by several weeks of rain. The remainder of the summer was characterized by raw, wet, dull weather. This resulted in the root crop generally being a failure. The beets were exceedingly small but their sugar-content, considering the conditions of growth, was fair. The soil was a sandy loam.

The results obtained on the Central Farm, Ottawa, have almost invariably been good, and those of the past season are among the very best in the series. The data show a sugar-content, for all the varieties, of over 17 per cent, with a coefficient of purity of considerably more than 90. The soil was a sandy loam of good quality.

The season at Brandon, Man., was not conducive to a high sugar-content, though the yield of roots was quite satisfactory. At seeding time the weather was cool and cloudy. A very wet June and July followed, with August and September characterized by considerable rain and very little sunshine. The beets show only a moderate sugar-content and fair purity, the average from the three varieties being the lowest in the series. The soil was a clay loam.

The beets grown at Indian Head, Sask., were of medium quality only, but decidedly richer than those at Brandon. The season generally was cool and wet, 9.87 inches of rain falling during the summer months. The soil was a clay loam.

At Rosthern, central Saskatchewan, the season was more than usually wet and the results generally very similar to those obtained at Indian Head. Though in richness the beets from this Station fall behind many others in the series, the yield was very good. The soil was a sandy loam.

The beets grown at Lethbridge, southern Alberta, were of excellent quality, both on irrigated and non-irrigated soils. They show a somewhat higher standard of quality than the crop of the previous year. The season during the early part was decidedly dry, but there was a more than usual rainfall during the summer and autumn months, so that irrigation was largely dispensed with as unnecessary. Though the yield on the irrigated land was invariably the larger, the results do not show any marked difference (save in the case of one variety) in richness between the beets grown on irrigated and non-irrigated land. Possibly this may be attributed in part to the character of the season, which, as already remarked, was decidedly wet for this locality.

Results obtained on irrigated and non-irrigated land from two kinds of seed supplied by the sugar factory at Raymond, Alta., are appended. The data are not quite so high as those from the varieties sown in this investigation, but nevertheless indicate a very good beet for sugar extraction. With this Raymond seed, the roots on the non-irrigated land were somewhat richer than those grown with irrigation. The average from the two series stands the highest in the list, though closely followed by those of Ottawa and Agassiz. The soil is described as moderately heavy, chocolate-coloured loam.

The season at Agassiz, B.C., may be described as generally cool and wet. Since 1906, the beets grown at this Farm have invariably been of an exceptionally high quality, both as to sugar-content and purity, and last season's crop (1912) maintains the good reputation gained for a first-class crop. The long autumn without frost or markedly low temperatures (the beets were pulled November 5), is evidently conducive to sugar production.

At the close of the foregoing table, a number of results are given that have been obtained at Charlottetown, P.E.I., Nappan, N.S., and Agassiz, B.C., from certain

good varieties of factory beets, the seed of which, however, was obtained locally. The data as regards sugar-content and purity are on the whole very satisfactory.

The following table will allow a comparison of the averages, as regards sugar-content, obtained since 1902 at several localities included in this investigation.

AVERAGE Percentage of Sugar in Juice in Sugar Beets grown on the Dominion Experimental Farms 1902-1912.

Locality.	1902	1903	1904	1905	1906	1907	1903	1909	1910	1911	1912
Charlottetown, P. E. I	.....	.....	....	.....	...	...	.....	...	14·25	17·23	15·31
Nappan, N. S	15·87	15·33	14·41	16·52	17·08	.....	17·53	16·74	16·43	17·56	16·68
Cap Rouge, Que	.....	...	.....	....	.....	....	.....	.....	.....	16·16	14·92
Ottawa, Ont	16·77	15·34	16·91	12·45	14·37	15·44	16·30	14·84	16·44	....	17·59
Brandon, Man	.....	11·36	16·62	11·09	15·50	16·99	15·82	18·83	18·40	13·50	13·40
Indian Head, Sask	15·15	16·54	15·24	14·94	14·91	15·92	15·66	17·16	.....	14·48	15·78
Rosthern, Sask	....	......	...	......	....	......	....	......	......	13·30	14·63
Lethbridge, Alta., (irrigated)	......	...	......	......	.....	....	16·09	17·91	......	17·02	17·41
" " (non-irrigated)	....	......	......	......	......	...	16·73	18·36	.....	14·05	17·68
Lacombe, Alta	.....	....	....	...	....	13·34	11·21	12·77	12·69	...	....
Agassiz, B.C	...	17·44	8·10	17·32	14·28	17·65	17·15	18·30	19·18	16·95	17·53

In almost every instance, the figures are very satisfactory, indicating beets of a superior quality and eminently suitable for factory purposes.

FERTILIZING MATERIALS.

During the year a number of materials have been received for examination as to fertilizing value. Many of these are deposits or other naturally-occurring substances, while others are by-products from manufacturing processes.* Details of a few of these are given, to indicate the varied nature of materials that may be used in agriculture and to furnish information of more or less general interest to farmers.

MARL.

Marl, as generally occurring in Canada, is essentially carbonate of lime, though in many European countries the term has been used to include calcareous mixtures of clay and sand containing as little as 5 per cent of calcium carbonate.

Shell marl is perhaps the most common of the calcareous deposits, being found to a greater or less extent in all the provinces of the Dominion. Its usual occurrence is beneath the 'muck' of swamps or forming a deposit on the bottom of fresh water ponds and lakes. The beds, or layers, are of varying thickness, from a few inches to several feet. It is easily recognized by the presence of many small shells, which are imbedded in a matrix consisting of clay, silt and carbonate of lime, formed largely from the disintegration of previous generations of shell fish. When freshly dug it is usually a grayish, pasty mass; on drying it becomes lighter in colour and forms a mass which may be easily crumbled. While here we have merely to do with the use of marl from an agricultural point of view, it may be mentioned that many of these deposits have been found of a high degree of purity, containing, when dry, upwards

* The official examination of commercial fertilizers sold in Canada is undertaken by the Inland Revenue Department, Ottawa, to whom all inquiries respecting suspected adulteration, etc., should be addressed.

of 95 per cent carbonate of lime, and some of these have been utilized in the manufacture of cement.

Of all the naturally-occurring sources of lime, marl is one of the most valuable and the cheapest for agricultural purposes. It is not to be regarded as a fertilizer (that term being now restricted to materials furnishing one or more of the following essential elements—nitrogen, phosphoric acid and potash—in notable amounts), but it is an amendment of very considerable importance. It may be used for the improvement of many types of soil—clays, sandy loams and peaty soils. This it accomplishes, first, by favourably altering their physical condition or texture. Especially is this the case with heavy clay loams upon which lime (or carbonate of lime) has the effect of destroying plasticity and rendering them more permeable to air and the passage of water. Thus it is that liming or marling such soils makes them mellower, more easily worked and affords the root system better facilities for rapid extension.

Secondly, it furnishes lime in a form agreeable to crop growth. Lime is a normal constituent of plant tissues, and crops need it for their development. It is for this reason that no soil can be accounted at its best that does not contain an appreciable amount of this element in an available form. Continued cropping reduces the store of available lime (and many soils are, originally, but poorly supplied) and further, in the course of time, washes down below the range of the feeding roots. We have in these facts the explanation why an occasional liming or marling is frequently beneficial, even on soils originally well furnished with this element.

Again, through the loss of lime, or rather carbonate of lime, and imperfect drainage, soils are apt to become sour, and it is generally recognized that soils only slightly acid are not congenial to the majority of farm crops. Lime or marl or ground limestone corrects this acidity and restores conditions favourable to plant growth. Acidity of soil is one of the causes of failure of the clover crop, and thus it has frequently been found that an application of lime, either as such or as marl or ground limestone, has been sufficient to ensure a good growth of this valuable crop, where before such could not be obtained.

And, thirdly, the micro-organisms engaged in the nitrification of the organic matter, which means the preparation or conversion of the inert nitrogen of the soil into forms suitable for the use of crops, cannot perform their important function in an acid soil, one which is deficient in available lime. This is also true of nitrogen-fixing bacteria, those which have the ability to fix atmospheric nitrogen without the aid of leguminous crops, as well as those associated with the legumes in this all-important work. One of the vital factors towards the development and activity of these organisms is a neutral or slightly alkaline soil, and it is in this we have the explanation that an application of lime in some alkaline form may vastly increase the productiveness of a soil, without having materially added to its store of plant food.

To sum up this discussion of the function of lime, as such or in the form of carbonate, for it must be remembered that it is in the form of the latter compound that slaked or quick lime exists soon after its admixture with the soil, the presence of carbonate of lime, then, whether supplied as lime, marl or finely-ground limestone, performs a very important triple role—physically, chemically and biologically—in influencing for good a soil's productiveness.

Physically, it is of value to all classes of soils, lightening and mellowing heavy clays and cementing and giving 'body' to sandy loams. For the improvement of texture it plays a most important part, especially in conjunction with efficient drainage, right culture and the supplying of organic matter.

From the chemical standpoint, it is first to be regarded as plant food, and hence indispensible to the best results for all soils deficient in lime. This deficiency may be due to the character of the rocks that formed the mineral basis of the soil or it may have arisen through a long term of cropping and the leaching out of soluble lime

compounds by the rain. Soils rich in lime, other conditions being favourable, produce a strong and vigorous vegetation of the highest nutritive qualities.

A further very important chemical function is that of neutralizing acidity or sourness, a frequent cause of failure, especially with clover, alfalfa and other legumes. Very few farm crops will thrive in a sour soil, even if the acidity is not strongly marked, and all do well on a neutral or slightly alkaline soil. From various causes—imperfect drainage, deficiency in lime, an excess of organic matter—many soils tend to become sour; even upland soils at times exhibit this tendency and correction or neutralization by lime becomes necessary to restore fertility. Herein lies, probably, the most important function of lime in soil treatment.

Biologically, lime is necessary for the development of soil bacteria, those minute organisms present in large numbers in every fertile soil and to whose life and growth are due the preparation of food for the use of higher plants—farm crops. Without this bacterial life, a soil would indeed be 'dead'; with conditions favourable to its development (and the presence of lime is one of them) we may utilize in a very high degree the stores of food, organic and mineral, largely inert as they occur in the soil, for it is through this agency, chiefly perhaps, that these stores are attacked and made to yield nourishment for crops.

There is a use and an abuse in the application of lime. The endeavour to keep up fertility by its frequent application without the addition of the essential elements of plant food and humus-forming material, will undoubtedly lead to the soil's exhaustion and diminished yields. There is ample proof in this country, as in other lands, for this assertion. Because there is a response at first to liming, it must not be concluded that productiveness can be maintained simply by this means. Rational farming calls at times for lime and the intelligent farmer will recognize the conditions that make its application desirable. It may then be depended on to give a profitable return, but science and experience alike teach that sole dependence upon this means results eventually in the running-out of the land, and failure.

In the following tabular scheme, we present the data obtained on certain samples of marl examined during the year.

Analysis of Marls (air-dried).

Laboratory No.	Locality.	Moisture, organic matter, etc.	Carbonate of Lime.	Mineral matter insoluble in acid.
		p. c.	p. c.	p. c.
11,213	Antigonish, N.S	5·17*	81·73	13·10
12,609	Pavilion, B.C.	5·25	89·73	5·02
13,105	Port Hope, Ont	18·97†	80·53	·50
13,753	Lower West River, N.S	4·16	81·00	14·94
14,053	Ste. Luce, Que	6·16	87·00	6·84
14,102	Clydesdale, N.S.	6·46	85·09	8·54

* Containing 0·58 per cent $CaSO_4$ (calcium sulphate).
† Containing 16·11 per cent organic matter.

No 11213.—From Mount Cameron, Antigonish, N.S. A yellowish, earthly deposit, in small lumps and powder. Associated with the carbonate there is about 0·5 per cent of sulphate of lime. Though not of very high quality, it would prove a useful amendment for all soils in need of lime. Its effect, no doubt, would be more marked and immediate if the material were crushed, say to the condition of a coarse powder.

No. 12609.—From Pavilion, B.C. This deposit in an air-dried condition was of a yellowish-grey colour, the mass being crumbly and friable, with the general appearance of marl. The data show that this is a marl of excellent quality.

No. 13105.—From the bed of a creek at Port Hope. As received, this was a greyish-white pasty mass, containing many small shells. In addition to 80 per cent carbonate of lime, the marl contains about 16 per cent vegetable organic matter, which would enhance the value of the deposit for certain soils.

No. 13753.—From Lower West river, Antigonish, N.S. A light yellowish-grey earthy deposit, in powder and small lumps and having the appearance of weathered, disintegrated limestone. Of fair quality. Its efficiency, no doubt, would be enhanced by crushing.

No. 14053.—From bottom of a lake near Ste. Luce, Rimouski, Que. As received, was whitish-grey pasty mass; on drying, it was found to be friable and easily reducible to powder. The analysis confirms the impression from its appearance—that it is a marl of very fair quality.

No. 14102.—From Clydesdale, N.S. A yellowish-red, earthy deposit in lumps of very considerable hardness. Analysis shows the presence of 85 per cent carbonate of lime, but in order that this material might prove an efficient amendment it would be necessary to reduce it to powder.

No. 13813.—From the bottom of a lake near St. Jovite, Que. A light-grey, earthy deposit, containing a good many small shells. A qualitative examination showed very little insoluble matter and the sample was reported as a shell marl of good quality.

No. 14055.—From Hedley, B.C. This calcareous material, evidently formed by deposition from water highly charged with lime, was submitted to qualitative analysis and found to consist essentially of carbonate of lime.

No. 14108.—From Consecon, Ont. As received, this was greyish-white and showed little or no admixture with clay or sand. It was completely soluble in dilute hydrochloric acid with brisk effervescence. Results by qualitative examination showed the excellent quality of this marl.

CALCAREOUS DEPOSIT.

No. 13969, Calcareous deposit. From Hedley, B.C. Analysis showed this to be a mixture of sulphate and carbonate of lime.

Analysis.

Sulphate of lime (gypsum)	77·27	per cent.
Carbonate of lime	14·02	"
Mineral matter insoluble in acid	3·40	"
Undetermined	5·31	"
	100·00	

Though the percentage of carbonate is not very large, it is nevertheless sufficient to make the deposit of value for correcting sourness in poorly-drained soils. It could, of course, be used on all types of soils, to supply lime, and to act as an indirect fertilizer.

Nos. 12351-2.—These are two samples of ground limestone forwarded from England with a view to establishing trade in Canada, provided their composition were satisfactory and there was a sufficient demand in agriculture for such material. Our analysis showed 96.07 per cent and 96.52 per cent carbonate of lime, respectively. Although these are of excellent quality and quite satisfactory from the mechanical standpoint, it seems doubtful if importation from such a distance could be prosecuted with profit. Canada has immense areas covered with limestone, and the question of crushing and transportation, so that the material can be delivered to the farmer at a reasonable price, will no doubt be solved if experience shows that our soils generally respond to this amendment.

GROUND LIMESTONE, LIME-KILN REFUSE, ETC.

No. 14019.—From the quarries at Cap St. Martin, Que. The ground limestone was partly as powder and partly as fine fragments of limestone rock.

Analysis.

Carbonate of lime	95·01 per cent.
Oxide of iron and alumina	·96 "
Mineral matter, insoluble in acid	4·14 "

The results indicate a limestone of good quality and one eminently suitable for agricultural purposes. It is desirable, however, that the material should be more finely pulverized.

Nos. 14155 and 14156.—These are two samples of so-called 'waste lime' from Randolph, N.B. Their analysis showed that they contained a large proportion of caustic lime. This product results presumably from the incomplete burning of limestone in the manufacture of quicklime.

Analysis.

	Blue Rock. No. 14155.	Magnesia. No. 14156.
In fine powder	58·60 per cent.	48·22 per cent.
In coarse powder and lumps	41·40 "	51·78 "
	100·00 "	100·00 "
Carbonate of lime	34·23 "	25·73 "
Caustic and slaked lime	43·45 "	30·67 "
Mineral matter insoluble in acid	1·50 "	·19 "

Both are good, but for agricultural purposes 'Blue Rock,' No 14155, is the better by reason of its higher lime-content and its larger proportion in the condition of a fine powder.

No. 14177, 'Agricultural Limestone.'—This sample obtained from V.-V. L and B Co., Victoria, and forwarded from Agassiz, B.C., was stated to be ground limestone containing about 10 per cent free or quicklime; evidently, as in the preceding case, it is a product of lime kilns. It was in the condition of a fine powder.

Analysis.

Mineral matter, insoluble in acid	4·97 per cent.
Carbonate of lime	67·34 "
Caustic and slaked lime	21·73 "

This should prove a useful source, agriculturally, of lime, and one from which good results might be expected, especially on heavy clays and sour soils. Its composition and fine mechanical condition point to a high degree of efficiency.

No. 13963.—Lime refuse or waste from tannery, forwarded from Fredericton, N.B. This, as received, was a greyish-white, pasty mass, with a small quantity of hair, but apparently no other foreign matter. The analysis in the air-dried condition gave the following data:—

Analysis.

Carbonate of lime	38·79	per cent.
Slaked lime	54·55	"
Mineral matter insoluble in acid	1·05	"
Undetermined (organic, etc.)	5·61	"
	100·00	

An excellent material for dressing lands in need of lime or for composting with swamp muck or peat.

No. 13623.—This was forwarded as a limestone from Cape George, Antigonish, N.S. This rock, it was claimed, had shown itself to have considerable value as a fertilizer. Our correspondent says, 'We spread it on the land last spring; it melted down like ashes and gave excellent results.' This sample was in hard lumps or fragments, not unlike shale.

Analysis.

Moisture	1·93	per cent.
Mineral matter insoluble in acid	75·44	"
Oxide of iron and alumina	10·60	"
Lime*	2·94	"
Magnesia*	3·41	"
Phosphoric acid	·17	"

* This lime and magnesia exist essentially as carbonates.

It is obvious that rock could not be classed as a limestone, since the carbonate of lime does not exceed 5 per cent. The percentage of phosphoric acid is very small, not exceeding that in many soils of medium fertility—and certainly not more available. It is rather difficult, therefore, to understand how this material can have any marked influence as a fertilizer, save in so far as it may favourably affect the mechanical condition of the soil.

GYPSUM OR LAND PLASTER.

Gypsum or land plaster is a naturally-occurring sulphate of lime, containing about one-fifth of its weight of water, known as water of crystallization. When gypsum is strongly heated (burned), this water is driven off and plaster of Paris remains. This is not used in agriculture, but is much valued in the arts from its property of making a white, hard cement when mixed with the requisite amount of water.

Gypsum, from the agricultural point of view, supplies lime, an essential constituent for plant growth. Since, however, this lime is combined with sulphuric acid and is present in a neutral condition it follows that gypsum cannot take the place of quick or slaked lime, marl or ground limestone (which are essentially alkaline in character) for the treatment of sour or acid soils. Apart from its function in supplying lime, it seems probable that the combined sulphuric acid in gypsum has, on certain types of soils, a manurial influence, but it is doubtful if its value from this standpoint is of any great economic importance.

Undoubtedly its chief value is as an indirect fertilizer, setting free potash from its inert or locked-up stores in the soil. While it does not add to the sum total of

the soil's potash, it performs a useful function in increasing the amount of this constituent in a form available for crop use. It is this property that has made it specially beneficial as a top dressing for clover, a crop that particularly responds to available potash.

The application of land plaster is usually from 300 to 500 pounds per acre, but larger dressings are sometimes found of benefit to heavy soils.

Gypsum possesses the property of 'fixing' ammonia, and for this reason is largely used in stables and cow barns. Thus employed, the sprinkling or dusting of the finely-ground material in the stalls serves to retain the nitrogen of the very readily decomposable urine and incidentally to keep the atmosphere of the building clean and sweet. It is this use of land plaster that we specially recommend, for by this means the value of the resulting manure is enhanced without any hindrance to the exercise of the other useful functions of this amendment subsequently in the soil.

By reason of its property of flocculating clay, its application to heavy loams may prove of very considerable benefit in rendering them plastic and more open and friable.

Similarly, an application of gypsum is valuable to lands affected by 'black alkali.' The sodium carbonate (sal. soda) which such soils contain not only acts directly as a corrosive chemical, cutting into and eating away the plant tissues (especially at the immediate surface of the soil, but its acts most injuriously on the physical condition of the soil. All kinds of alkali have a tendency to destroy good tilth, but this is particularly marked in the case of black alkali. Soil, so affected, readily puddles. becomes impervious to water and air and dries into hard, refractory masses. The addition of land plaster converts the carbonate of soda into sulphate of soda—the chief constituent of 'white alkali,' a milder form of alkali as regards vegetable life and one with less effect on the physical condition of the soil.

Commercial gypsum is somewhat variable in composition; poor samples may not contain more than 65 per cent sulphate of lime, while high grades will reach 90 to 95 per cent. Analysis of some samples recently examined are as follows:—

Analysis of Gypsum.

	A.	B.	C.	D.
	p. c.	p. c.	p. c.	p. c.
Sulphate of lime	94·12	94·40	87·47	91·80
Mineral matter insoluble in acid	1·03	·32	1·43	2·99
Undetermined	4·85	5·28	11·10	5·21
	100·00	100·00	100·00	100·00

Samples A, B, and C are from the Tobique River district, N.B., where gypsum is largely quarried, and D is from Hants county, N.S. In addition to the vast deposits found in Nova Scotia and New Brunswick, gypsum occurs in several localities in Ontario, and more particularly in the vicinity of Paris along the Grand river, associated with dolomite rocks.

WOOD ASHES.

No. 12852.—This sample was taken from a heap of leached ashes from an old potash works at Carleton Place, Ont.

Analysis showed that the ashes had been very thoroughly leached, the percentage of potash being only ·022. While the fertilizing value of this residue must be very small, its application would no doubt improve certain soils, so that, if cheaply obtained, it might be found useful as an amendment.

Laboratory No. 13774.—This is the ash from a 'waste' burner of a shingle mill near Sidney, B.C. An analysis has afforded the following data:—

Analysis.

	Per cent.
Mineral matter insoluble in acid (sand, clay, charcoal, etc.)	19·20
Lime, present largely as carbonate	12·40
Potash	1·10
Phosphoric acid	·92

While these ashes do not possess as high a percentage of potash as good quality hardwood ashes (which on an average contains from 5 per cent to 6 per cent) they undoubtedly have a fertilizing value. They should be found more particularly useful for leafy crops—corn, potatoes, roots, clover, etc.—on light and sandy loams. Their profitable use would of course depend largely on their cost laid down at the farm.

Laboratory No. 13521.—From Valcartier, Que. These ashes, presumably, had been obtained by house to house collection and, as received, were quite dry. They appeared to contain a considerable amount of charcoal, scraps of iron, pottery, etc.

Analysis of (Air-dried) Ashes.

	Per cent.
Moisture	1·04
Mineral matter insoluble in acid	41·43
Organic and volatile (charcoal, etc.)	17·80
Oxide of iron and alumina	20·96
Lime	10·14
Magnesia	·77
Potash	2·76
Soda	1·08
Phosphoric acid	1·10
Carbonic acid, etc. (undetermined)	2·92
	100·00

Good, unleached wood ashes do not, as a rule, fall below 5.5 per cent potash; this sample, therefore, is of inferior quality. It would seem that these ashes have been partially leached, or contain too high a percentage of sand and other foreign matter. They were being sold at from $8 to $10 per ton, whereas from their potash-content they were worth about $3.50 per ton. The lime and phosphoric acid present are, of course, of agricultural value, but they would not appreciably influence the market price of the ashes.

POTASH RESIDUE FROM OXYGEN-ACETYLENE PLANT.

This is the by-product from the oxygen acetylene plant and results from the preparation of oxygen (used in welding and other high temperature operations) by the heating together of potassium chlorate and maganese dioxide. The latter is unchanged in the process, merely acting as a catalytic agent and facilitating the evolution of oxygen gas; the chlorate is reduced to chloride. The residue therefore consists of potassium chloride and the insoluble manganese dioxide. Considerable quantities of this by-product have accumulated at several centres in the Dominion. The inquiry is, can this material be used agriculturally as a source of potash, either by itself or mixed with other fertilizers, without injury to soil or crops?

Laboratory No. 11361.—This sample was from Winnipeg, Man., and was found to contain 70.67 per cent potassic chloride, equivalent to 44.60 per cent potash (K_2O), all of which is entirely and easily soluble in water and readiy available for plant use.

Laboratory No. 13693.—This from New Glasgow, N.S., and contained 85.27 per cent potassic chloride, equivalent to 53·84 per cent potash (K_2O).

It is evident from these results that this residue is very rich in potash and one that should prove of considerable agricultural value.

The question naturally arises: Would the associated manganese dioxide have any injurious effect on vegetation? Experiments have shown that small quantities of soluble manganese compounds act as stimulants on plant growth, but that larger amounts are toxic. The manganese in this residue is quite insoluble, and there seems no reason to suppose that any injurious effect would follow its application. As yet we have no results from practical field tests with this material and, therefore, it cannot be definitely stated that the manganese would not become, in the course of time, more or less soluble in the soil. If such proved to be the case and injury to crops resulted the potash salts could be leached from the residue and subsequently used in fertilizer preparations. But any such injury to crops is not to be feared and we should have no hesitation in using it, in the ordinary application that potash fertilizers are made.

ROCK SUPPOSED TO CONTAIN POTASH.

Laboratory No. 11683.—The active search that has been prosecuted in the United States during recent years for native sources of potash has, in some degree, spread to Canada. This has led to sending to the Farm laboratories by explorers and others of several samples of rocks, mineral waters and brines supposed to contain potash in notable quantities and in a condition more or less available for agricultural purposes. So far the quest has not been sucessful and, to the best of our knowledge, the sea-weeds of our coasts remain to-day the only native source of potash suitable, without treatment, for agricultural purposes. The analytical data now to be given are from a rock specimen obtained in the East Kootenay, B.C. It was soft and of a slaty-grey colour, with irregular veins or pockets of a lighter and softer material scattered throughout it. For analysis the whole sample was crushed to a fine powder.

For water-soluble potash five grams were shaken for five days in 1000 cc. of distilled water and filtered. The filtrate contained ·0927 per cent potash. Qualitative analysis showed the presence of a considerable amount of sulphate of lime.

Digestion with hydrochloric acid. This involved digestion with strong hydrochloric acid (Sp. Gr. 1·115) for several days at the temperature of boiling water. The results obtained are as follows.

Analysis.

	Per cent.
Insoluble rock matter	8·72
Oxide of iron and alumina (Fe_2O_3, Al_2O_3)	1·06
Lime (CaO)	29·10
Magnesia (MgO)	6·38
Soluble silica (SiO_2)	·43
Sulphuric acid, combined (SO_3)	26·98
Phosphoric acid (P_2O_5)	trace
Potash	·25
Water, carbonic acid, etc., by difference	27·58
	100·00

Total potash by fusion. For this determination, the rock was thoroughly decomposed by fusion with alkaline carbonates, and the result lixiviated with dilute acid. The solution contained ·51 per cent potash.

It is evident, in the first place, that the rock is essentially sulphate and carbonate of lime and might be regarded as a low-grade gypsum.

Secondly, these three analyses are conclusive in showing that this rock has no value as a commercial source of potash.

MARSH MUDS FROM CORNWALLIS, KINGS CO., N.S.

Laboratory No. 13274.—This is from the bank of a creek, taken below the level of the grass-producing mud. It dries on exposure into masses or lumps of a dull red colour which, though hard, are fairly friable. Examination indicates that the mineral or rock constituents are very finely ground; there is neither coarse sand nor gravel present. Although there is sufficient silt and clay present to give tenacity to the dried material, it would appear that the chief component is fine and very fine sand. There are no visible evidences of organic debris.

Laboratory No. 13275.—From the land upon which the salt grass grows. In general appearance and nature this mud bears a strong resemblance to the preceding sample. Closer examination, however, shows it is not as homogeneous, that many of the lumps are, save on the outside, greyish, and the dried masses are somewhat tenacious and refractory, possibly due to the presence of a little more clay. It is free from gravel and coarse sand and under the microscope has much the same appearance as No. 13274.

Laboratory No. 13276.—This was designated as 'blue marsh mud,' underlying the red marsh mud, Laboratory No. 13274, to a depth of six inches to six feet. This, in the air-dried condition, is grey and forms rather tough masses. Except in colour it is not unlike the two preceding samples, though possibly somewhat richer in clay.

ANALYSIS OF (AIR-DRIED) MUDS.

	No. 13274.	No. 13275.	No. 13276.
	Per cent.	Per cent.	Per cent.
Moisture	1·21	2·03	1·32
Organic and volatile matter	4·82	9·38	6·38
Mineral matter insoluble in acid (clay, sand, etc.)	81·39	72·37	78·94
Oxide of iron and alumina	9·22	12·72	9·05
Lime	1·20	·36	·38
Phosphoric acid	·13	·19	·11
Potash	·46	......	·64
Nitrogen	·114	·245	·118

These data are in fair accord with those previously obtained in the Farm laboratories from the examination of tidal deposits of the bay of Fundy, and very clearly, in our opinion, indicate the general nature of these muds. They are amendments rather than fertilizers, that is, they may be used to generally improve or recuperate soils (and more particularly so when applied liberally and for the first time on worn soils) rather than to furnish notable amounts of available nitrogen, phosphoric acid and potash, which is the special function of commercial or chemical fertilizers. The amounts present in these tidal deposits of the more essential elements of plant food do not, as a rule, exceed those in soils of average quality, nor are these muds rich in organic matter which would make them of value in increasing the soil's store of humus-forming material. Nevertheless, they have a value for occasional use, as renovators, probably benefiting the land as much from the physical as from the chemical standpoint.

While the amounts of the fertilizing constituents in these marsh muds are not large, such plant food as is present, exists in a comparatively high state of availability and to this fact, apart from their physical influence on the soil, undoubtedly these muds very largely owe their value. This phase of the subject—the availability

of the plant food in marsh muds—was investigated some years ago, and a discussion thereof will be found in the Report of the Division of Chemistry for 1899.

All three samples are of the same type or character and no great differences in agricultural value exist between them; No. 13275, however, by reason of its larger percentage of organic matter and nitrogen, might be expected to prove the best of the three samples. The colour of No. 13276, bluish-grey, would become red on exposure of the mud to the air, due to oxidation of its iron, and not until this change is brought about would it be advisable to incorporate the mud with the soil, when applied as an amendment.

It is difficult to see wherein any very great advantage can result from the continued use of these muds, for they do not supply in any notable quantity those elements in which most poor soils are more or less deficient. They may affect favourably the texture of a soil and they furnish a certain small amount of plant food, but they cannot be regarded as substitutes for farm manures or comparable to commercial fertilizers. That some benefit may accrue from their application is quite possible, but we certainly think it advisable to try out the 'mud' on a small area before going to any considerable expense in digging and hauling it on to the land.

RIVER MUD.

This sample (Laboratory No. 11230) was forwarded from Launching, P.E.I., where it was stated it can be obtained easily and in large quantities. The inquiry accompanying it was as to its fertilizing value on sandy loam that was somewhat light and dry. In the air-dried condition the mud was of a light-reddish colour, in lumps of an easily friable character, consisting largely of sand with a few small shells.

ANALYSIS of (air-dried) Mud.

	Per cent.
Moisture	3·16
Organic and volatile matter	13·87
Mineral matter insoluble in acid (clay, sand, etc.)	69·78
Oxide of iron and alumina	6·95
Lime	·56
Fertilizing constituents—	
Phosphoric acid	·36
Potash	·28
Nitrogen	·52

The chief manurial value of this deposit lies in its organic matter and nitrogen, in both of which it is comparatively rich. In phosphoric acid, potash and lime, the amounts are not exceptional, but rather those found in many good, fertile soils.

While as regards plant food it is not comparable to farm manures or commercial fertilizer, it is reasonable to suppose that it would prove a useful amendment, more particularly for heavy soils, poor in vegetable matter. These latter it would improve physically as well as chemically, rendering them more open and friable. While, of course, it should not be depended on solely to maintain fertility, an occasional application would no doubt give a good return.

River Mud, Laboratory No. 11272.—From the bed of the Murell river, P.E.I., and dug in salt water. In the air-dried condition (water, 4·44 per cent) it was found to contain 26.44 per cent organic (vegetable) matter and .81 per cent nitrogen. It is thus shown to be a valuable amendment for soils exhausted by cropping, and which have not been adequately manured. Composting the partially dry material for a few weeks would be desirable, though on some soils there might be a fair response to an application of the crude, raw muck.

OYSTER MUD.

This sample (Laboratory No. 11231), was sent from Amherst, N.S., and stated to have been taken from an old oyster bed in the channel of a river. The correspondent inquired as to its value as a fertilizer. It was of a reddish colour and consisted of a matrix of clay in which was embedded a number of shells and fragments of seaweed. On drying it formed rather hard masses, which, however, were capable of being reduced by moderate crushing. Its analysis accorded the following data:

Analysis of (Air-dried) Mud.

	Per cent.
Moisture	·86
Organic and volatile matter*	7·43
Mineral matter†	91·71
	100·00
* Containing nitrogen	·144
† Containing carbonate of lime	5·66

Although this material has a certain agricultural value, it cannot properly be considered as a 'fertilizer,' that is, it would not furnish in notable amounts any of the essential constituents of plant growth, nitrogen, phosphoric acid and potash. It is rather of the nature of an 'amendment,' and might be found useful for land that would be benefited by liming. The proportion of nitrogen does not exceed that in many soils of average fertility. It could not, therefore, be considered as of any special value for furnishing this important element. The amounts of phosphoric acid and potash were not obtained quantitatively but qualitative results showed that they were insignificant and, therefore, of no particular value from the standpoint of enriching the soil.

MUCKS.

Laboratory Nos. 11115-6.—From Broughton Station, Que. These two samples of swamp muck were rather peaty in character and decidedly acid.

As received, their analysis gave the following results:—

Analysis.

	No. 11115. Per cent.	No. 11116. Per cent.
Water	24·46	18·24
Organic matter	62·58	69·26
Mineral matter (clay, sand, etc.)	12·96	12·50
	100·00	100·00
Nitrogen in organic matter	1·33	1·59

These are excellent mucks, rich in nitrogen and undoubtedly useful for the improvement of soils poor in humus. It is possible that their employment without previous treatment might prove advantageous for heavier loams, but they should be composted for lighter soils.

INFUSORIAL EARTH.

Laboratory No. 13289.—From Hillbank, Vancouver island, B.C. This material, not unlike marl in appearance, underlies a large area of loam land which is of a peaty nature. Examination shows it to be a species of 'infusorial earth,' consisting largely of diatoms and sponge spicules. It is of no agricultural value, being practically destitute of plant food. Not infrequently deposits of infusorial earth and of fine silt or clay are mistaken for marl, the usual occurrence of which is below swamp

muck. Marl, which is carbonate of lime, may be recognized by the brisk effervescence set up on the addition of acid; there is little or no effervescence from the other deposit named.

LOBSTER REFUSE.

No. 13914.—This waste product from a lobster cannery in Nova Scotia was received in the form of a coarse powder. Our correspondent writes, 'This material contains both body and shell of the lobster. We have dried it and ground it in a simple way in order to get it into condition for handling. We should be glad to have a report as to its fertilizing value. As received, the product was quite sweet and in excellent condition for application to the soil.

Analysis.

	Per cent.
Moisture	5·71
Nitrogen	4·70
Phosphoric acid*	2·72
Lime (present as carbonate, phosphate, etc.)	20·90

It is quite evident that this material has a very considerable fertilizing value, for from present results one ton would contain 94 pounds nitrogen and 54 pounds phosphoric acid. The nitrogen is not present in an immediately available form, but in mellow, warm and moist soils it would no doubt be readily set free in a condition usable by crops. Similarly, the phosphoric acid is not of immediate value to crops, but the ready decomposition of waste in the soil would quickly liberate it in more or less easily assimilable forms. Indeed, it might be expected to act as quick and forcing manure, provided the soil is not too heavy and the moisture and temperature conditions are favourable. It should also be valuable in the making of composts.

As will be seen, it is essentially a nitrogenous fertilizer and in consequence its use, in many cases, would have to be supplemented by an application of the mineral elements—phosphoric acid and potash—for the best results. This could be accomplished by the addition of superphosphate and muriate or sulphate of potash—the proportions being dictated by the character of the soil and the nature of the crop to be fertilized.

The analysis in 1897 of two somewhat similar samples of dried lobster refuse showed, on a 10 per cent moisture basis:—

	A. Per cent.	B. Per cent.
Nitrogen	5·2	3·2
Phosphoric acid	2·8	3·4

These results indicate a certain variableness in composition, which, considering the nature of the refuse, is easily understood—the larger the proportion of 'bodies' the more nitrogenous the waste, whereas a preponderance of tails, claws and shells would render it more distinctly phosphatic in character.

DOG FISH SCRAP.

The dog fish, a species of shark, by reason of its voraciousness and its abundance in Atlantic waters, has done great injury to the cod, haddock and other fisheries on the eastern coast. To keep it in check and thus protect the fisheries, the Government some years ago offered a bounty for the capture of this pest and established a reduction works (at Canso, N.S., and Shippigan, N.B.) wherein the fish could be utilized

* Equal to 5·72 per cent phosphate of lime.

to advantage. The chief products of this rendering or reduction, as it is called, are oil and a scrap or refuse characterized by a high percentage of nitrogen and hence of considerable value as a fertilizer. The process, in the outline, is as follows:—

> On bringing in the fish, the livers are removed and the remainder softened and 'digested' in suitable vessels by means of superheated steam.* This causes the greater part of the oil to separate. After drawing off the oil the residue is run through presses, to further exclude oil and get rid of a large proportion of the water, and dried in spiral heaters.

For the past seven years this scrap has been periodically analyzed in the Farm laboratories at the request of the Department of Marine and Fisheries (the branch of the Government service controlling the reduction works) and the results published for the benefit of farmers in the reports of this Division. During the past year, two samples of this scrap from the works at Canso, N.S., have been submitted to analysis.

Analysis of Dog-fish Scrap.

	No. 11268. Per cent.	No. 13287. Per cent.
Moisture	8·44	3·87
Nitrogen	8·89	10·80
Phosphoric acid	2·88	3·90
Total mineral matter	8·16	8·00
Mineral matter insoluble in acid	·47	·09
Oil	24·72	22·19

In all essential features, these results agree fairly well with those of previous years. They indicate the high manurial value of the scrap, primarily as a source of nitrogen, and secondarily of phosphoric acid. From the nature of the material and the method of its preparation, some variation in composition might be expected from time to time—and such has been the case. Hitherto, however, the larger number of samples have fallen within the following limits: Nitrogen, 7.5 per cent and 9.5 per cent; phosphoric acid, 2.5 per cent and 3.5 per cent. Of the present samples, No. 13287 is decidedly superior, both as regards nitrogen and phosphoric acid, to the average output of the works. The value of this scrap in the field as compared with other fertilizers is a matter not yet finally settled. Some farmers in Nova Scotia have spoken highly of the response observable on its application, while others report that they have been disappointed in its use. Fish waste, as a rule, is a quick, forcing manure readily nitrifying in warm, moist loams that are moderately light. In cold, heavy, ill-dried clays, however, the setting free of its plant food in available forms would be necessarily slow and consequently upon such there would not be an adequate return the season of application, even though the soil stood in need of nitrogenous fertilizer. It will be noticed that this scrap contains from 20 per cent to 25 per cent of oil. This is objectionable, not because oil is of no manurial value but because its presence in such large quantities retards the decomposition of the refuse in the soil and the setting free of its plant food. Moreover, if large dressings are applied for a number of years, the accumulation of oil may injuriously affect the tilth of the soil.

Correspondence is invited from those who have tried or who purpose trying this fertilizer; possibly information can be given as to its use that may be of assistance. It is well to bear in mind that it is not a 'complete' fertilizer; for many field and garden crops it should be supplemented by phosphatic and potassic fertilizers. The home mixing of fertilizers is not a difficult matter, and formulæ will be suggested to meet various requirements provided particulars are furnished as to the nature of soil and its history as to manuring and cropping and the character of the crop to be grown.

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* The livers being exceedingly rich in oil, which is considered of finer quality than that in the bodies of the fish, are separately rendered.

NITRATE OF LIME (LIME-NITRATE, LIME-NITRE, ETC.)

This is a fertilizer of recent introduction, containing from 12 to 14 per cent of nitrogen present in a highly soluble and available form. This material is not pure calcium nitrate but is essentially a mixture of this compound and lime. Its manufacture on a large scale is now carried on in several European countries—notably in Norway, Austria and France—and though there are several processes in operation, they are all the same in principle—the oxidation of atmospheric nitrogen by means of an electric arc or flame and the subsequent neutralization of the nitric acid so formed by lime.

As yet, there is but little experience on this continent with lime nitrate, but experiments of an extensive nature which have been in progress for so many years, in England and other European countries, go to show that its nitrogen, unit for unit, is just as valuable as that of nitrate of soda. It is considered as among the most promising of the competitors of Chili saltpetre in the fertilizer markets of the world. As a source of immediately assimilable nitrogen it is capable of wide application, but it is thought it will be found, by reason of its basic character, particularly suitable for peaty and clay soils.

A sample submitted for our examination, forwarded from London, England, Laboratory No. 13179, and stated to contain 'about 13 per cent nitrogen' was analyzed and found to contain 12·984 per cent nitrogen, of which 12·954 per cent was readily soluble in water. Its concentrated and highly available character will be apparent from these data. The fertilizer, as received, was in the form of a coarse, grey powder, not unlike in appearance to finely crushed shale, and was readily soluble.

INSECTICIDES AND FUNGICIDES.

FORMALDEHYDE.

There is in these days, a very large and ever-increasing use in agriculture of formaldehyde, chiefly in the treatment of wheat for the prevention of smut. For this purpose, in many districts of the Canadian Northwest, it has almost entirely taken the place of bluestone (copper sulphate)—the time-honoured smut preventive. This substitution has much to commend it, for, compared with the bluestone solution, that of formaldehyde is equally efficacious in destroying smut, is more easily prepared (since dilution only is necessary), and is less injurious to the vitality of the treated grain.

We have, from time to time since 1902, analyzed samples from the various brands on the Canadian market and the results have shown that the manufacturers are putting out an article of very fairly uniform strength and conforming to the guarantee. Occasionally a sample is sent in that has proved below strength, but such, it has always been found, had been purchased from bulk and not in the original container. Our records, as remarked, do not show that adulteration exists to any degree, nevertheless it would appear that both manufacturer and user would be better protected if the formaldehyde were sold in sealed bottles, say of 1, 2, 5 and 10 pounds each, rather than retailed from bulk.

A sample received during the year (Laboratory No. 11257) from Delmas, Sask., and which had been purchased from bulk (manufacturers unknown) was found on analysis to contain 31.82 per cent formaldehyde. This is decidedly below standard strength, which calls for approximately 37.3 per cent by weight or 40 per cent by volume.

Another sample (Laboratory No. 11383), forwarded from Parr, Alta., was found to contain 38.05 per cent formaldehyde and was therefore in conformity with the guarantee.

LIME-SULPHUR SPRAY.

Lime-sulphur spray is fast supplanting Bordeaux mixture in many of our fruit-growing districts as a fungicidal wash, especially as a preventive against apple spot. It is not improbable that this increasing popularity is due in a large measure to the ease with which the spray may be prepared—simple dilution only being necessary—when the concentrated wash is purchased. Home manufacture of the lime-sulphur wash, once so common, is now comparatively rare. It is certainly a somewhat troublesome operation and it entails a determination of the strength of the resultant wash in order to arrive at the correct dilution necessary before it is ready for use. However, for those who consider it the more economical to prepare the wash and who have facilities for the work, formulæ and directions will be found in the reports of this Division for 1908 and 1909, and further assistance if desired, will be given by correspondence.

The commercial lime-sulphur washes upon the market have been examined by us for a number of years past. Consideration of the results indicates that the larger number of brands are now well-made, contain a goodly proportion of their sulphur as sulphide and are of fairly uniform and satisfactory strength. In the first years of this spray, inferiority due to faulty manufacture was occasionally noted, but methods have evidently improved, so that now it is seldom one meets with a wash that has been poorly made or is below the recognized standard strength.

Samples of five prominent brands sold in Canada have been submitted to analysis, with the following results:—

ANALYSIS OF LIME-SULPHUR WASHES.

Laboratory No.	Brand.	Specific gravity.	Sulphur in solution. Total.	Sulphur in solution. As sulphide.
			p. c.	p. c.
11321	'Vanco,' Toronto, Ont.	1·2676	23·20	21·87
11359	'Grasselli,' Cleveland and Toronto, Ont.	1·2925	25·73	25·09
11385	'Niagara,' Burlington, Ont.	1·2855	24·84	24·00
11386	'Rex,' Burlington, Ont.	1·3020	25·51	24·43
14507	'Victoria,' Victoria, B.C.	1·3140	24·80	23·62

We have in these data satisfactory evidence of good quality and they further indicate, as has been noted in past years, that no great difference in strength exists among the larger number of lime-sulphur washes put on the market by reputable firms.

The questions of strength of sprays for summer and winter use, methods for determining strength by the hydrometer and necessary dilution, with other information relating to the concentrated and diluted wash, are discussed at some length in the report of this Division for 1912, copies of which are obtainable on application. The chapter will be found of interest to all orchardists using lime-sulphur spray for the control of insect and fungus pests.

SOLUBLE SULPHUR.

This compound has recently been introduced by the Niagara Brand Spray Co., Burlington, Ont., as a substitute for lime-sulphur. It is in the form of a fine, yellowish powder and for use is dissolved in water, in which it is almost entirely soluble. If successful as a fungicide, it would be an important competitor of the

lime-sulphur wash as the preparation of the spray is a very simple and clean operation and freight charges would be very light compared with those on the heavy, bulky lime-sulphur.

Two samples from the material freshly manufactured, were submitted to analysis:

Analysis of Soluble Sulphur.

—	No. 13655.	No. 13673.
	p. c.	p. c.
Total sulphur	58·20	56·20
Sulphur present as sulphide	44·07	40·30
" " in compounds other than sulphides	14·13	15·90
Matter insoluble in water	traces.	·40

Both samples contained carbonate of soda, as a residual in the process of manufacture. The sulphur compounds have sodium as a base and it is quite evident from the data that a large percentage of them exist in other forms than sulphide. From our experience, and that of other investigators, it is the sulphide sulphur that practically determines the fungicidal value of the spray and, consequently, these other-than-sulphide compounds—sulphites, hyposulphites, etc.—may be left out of consideration by the orchardist.

There is as yet no experience with this spray, either as to effectiveness in controlling fungous diseases or its harmlessness to foliage, and therefore its value as a substitute for lime-sulphur cannot as yet be stated. While it might prove effective as a winter spray on dormant wood it seems probable, from its strongly alkaline character, that it might be injurious to tender foliage, save in very dilute solutions.

APTERITE.

This preparation is described as a 'soil-fumigant' and 'fertilizer' and, further, as a 'scientifically prepared powder,' the purpose of which 'is to destroy the many insects and other pests which live or hibernate in the soil and damage the crops.' It is a purplish red powder smelling strongly of napthalene. Its examination yielded the following data:—

Analysis.

	Per cent.
Phenol and homologues (crude carbolic acid, naphthalene, etc.)	20·50
Oxide of iron and alumina	3·20
Silica	6·65
Lime (present largely as sulphide and carbonate)	29·05
Sulphur (present as sulphide)	3·36
Magnesia	·38
Soda	trace
Potash	none
Phosphoric acid	traces
Nitrogen	traces

It would appear to be essentially sulphide of lime, probably gas lime—a by-product of the gas works long recognized as having a value for the destruction of noxious insects in the soil—with napthalene oils. The red dye present is probably a 'lake.'

As it only contains mere traces of nitrogen, phosphoric acid and potash, it cannot be said to have any value as a fertilizer, though its lime may act as an amendment.

Preparations of this character have been used in England to protect many classes of crops from insect ravages, being used at the rate of 2 to 3 cwts. per acre, and dug or ploughed in before sowing the seed or planting the land. The experience with

these 'deterrents' or soil disinfectants in Canada is as yet limited, but such as there is has not been very favourable from the economic standpoint. It will be understood, therefore, that at the present time we are unable to recommend them and that further experimental work is necessary to establish their usefulness and efficiency. The analysis of a similar preparation (Vaporite) will be found in the report of this Division for 1908.

COAL-TAR DISINFECTANTS AND DETERRENTS.

Two products of this nature forwarded by the Kingsdale Poultry and Supply Co., Sussex, N.B., have been submitted to analysis.

'Cow Spray,' Laboratory No. 11325.—This is probably a by-product of coal distillation below 250°C. It consists almost entirely of coal tar hydrocarbons, one-third of which distils over below 150°C. (light oils of the nature of kerosene) and a second third between 150°C. and 210°C. The remaining third consists of heavy napthalene oils, distilling between 210°C. and 240°C. There is present a small amount of tar residue. We have no knowledge as to its practical usefulness as a protection to cattle against flies, but preparations of this character have been advocated and used for this purpose.

'Lice Spray,' Laboratory No. 11326.—This is an emulsion consisting essentially of coal tar hydrocarbons and a resin soap. It probably contains cresols or analogous bodies. Coal oil (kerosene) has long been used, and with success, for ridding the poultry house of lice, and there seems little reason to doubt that a preparation of this nature would serve the purpose equally well. It remains to be shown, however, that it would be more efficacious or cheaper than the older and well-tried remedy.

LEAD ARSENATE.

Three brands of this insecticide have been analyzed, the samples being submitted by the Horticultural Division which had them under trial in the Farm's orchards.

ANALYSIS of Arsenate of Lead.

Laboratory No.	Brand.	Water.	Total. arsenic oxide.	Total lead oxide.	Soluble arsenic oxide.	Soluble lead oxide.
		p. c.	p. c.	p. c.	p. c.	p. c.
11387	Grasselli	55·16	11·44	30·22	·06	Nil.
11388	Niagara	48·14	14·15	33·96	·06	"
11389	Rex	36·22	17·55	40·88	·08	"

It is quite evident from the results obtained in the labratory that considerable difference in lead arsenate content exists among the various brands of this insecticide upon the market. As we pointed out in a previous report there are, no doubt, difficulties of manufacture that militate against turning out continuously a product absolutely constant as to water-content (which necessarily fixes the lead arsenate content), but there seems no reason, if good methods are used, why greater uniformity than is to be observed to-day could not be attained. Many firms are now putting a

guarantee on the label, stating percentage of lead arsenate present and particulars as to soluble impurities. This practice is to be commended as furnishing the purchaser information required in making sprays of any desired strength and in allowing him to judge of the relative values of the various brands offered for sale.*

AGRICULTURAL BLUESTONE.

This compound, a crystalline mixture of the sulphate of copper and sulphate of iron, is frequently sold for bluestone or sulphate of copper, to which it is distinctly inferior in the treatment of wheat for the destruction of smut. Further, it is worthless for the purpose of making Bordeaux mixture, the common use of bluestone by orchardists. Some years ago there was a considerable amount of this compound on the market in the Canadian Northwest and we warned our readers against purchasing it, as the fungicidal power, as shown by our experiments, was very materially reduced by the presence of the sulphate of iron. For sometime past no samples have been received at the laboratories, but one was forwarded a few months ago from Armstrong, B.C., which had been sold as bluestone. This sample, (Laboratory No. 13550), proved, on analysis, to contain 77·05 per cent of sulphate of iron. Subsequently a similar sample was forwarded by another correspondent from the same district and was found equally impure.

Bluestone has a deep blue colour (it may be slightly effloresced on the surface due to loss of water of crystallization) and if to its solution in water a slight excess of ammonia is added, the precipitate that at first forms dissolves entirely, the solution being intensely blue. Agricultural bluestone may be recognized by its greenish hue and by the fact that on the addition of ammonia to its solution a dirty, yellowish-red precipitate of hydrated oxide of iron persists. The term 'agricultural' as applied by the trade to this compound, is misleading; there is no use in agriculture in which it is not inferior to bluestone—and for some purposes, as for Bordeaux mixture, it is worthless.

CARBOLIZED WHEAT PROTECTOR.

This preparation made by G. B. Clark, Woburn Sands, England, is sold for the treatment of wheat, oats and barley for the destruction of smut, and consequently comes into competition with the two well-tried remedies, (bluestone and formaldehyde). It is also stated to act as a preventative against 'rust, bunt and mildew and the ravages of slugs, wire-worms, and the attacks of birds and other farm pests.' It is a reddish powder, smelling strongly of carbolic acid. Its analysis afforded the following data:—

Analysis.

	Per cent.
Sulphate of iron	71·89
Sulphate of copper	25·98
Crude carbolic acid	·56
Red ochre	·10
Mineral matter insoluble in acid	·61
Undetermined	·36
	100·00

It is not at all probable that the use of this compound, which is practically 'agricutural bluestone,' with a little carbolic acid and coloured with ochre, would prove as effective for the treatment of wheat as either of the chemicals now in common use. For smut destruction, the value of carbolic acid in dilute solutions is extremely doubtful; such evidence as we have would appear to be distinctly adverse to its suc-

* A chapter of the physical and chemical properties of arsenate of lead, together with an account of the 'neutral' and 'acid' forms found on the market, will be found in the Report of the Chemical Division, 1912.

cessful employment as a fungicide. Sulphate of iron (copperas), as our experiments have shown, has a very low fungicidal power compared with that of bluestone (sulphate of copper). Consequently, we may conclude that its value for this purpose practically depends upon its bluestone content, which the analysis shows to be 25 per cent.

POTASSIUM CYANIDE.

This chemical is used for the production of hydrocyanic (prussic) acid used in the fumigation of nursery stock, greenhouses, etc. Commercial grades nowadays usually contain large percentages of sodium cyanide or, indeed, they may be entirely sodium cyanide. This in itself is no disadvantage, but rather the reverse, since weight for weight, the sodium compound will disengage a larger amount of hydrocyanic gas than will the potassium salts. Certain low-grade cyanides, however, are on the market and these will be more or less ineffective unless used in larger quantities than called for by formula. It will be, therefore, for the purchaser when ordering to stipulate the high-grade cyanide (98 per cent to 100 per cent) and further, if possible, to obtain it in unopened containers as put up by the wholesale druggist. The latter precaution is advisable by reason of the readiness with which this compound deteriorates when exposed to the air. In a bottle of cyanide kept loosely corked for some months and examined in the farm laboratories it was found that the lumps at the top had lost nearly two-thirds of their strength. Several samples of cyanide bought from bulk were analyzed and were found to a greater or less degree below the guaranteed strength, but those obtained in original and sealed containers conformed with the guarantee.

Owing to the extremely poisonous character of cyanide and of the hydrocyanic acid gas, which it so readily evolves, the very greatest care must be exercised in handling this material or in conducting a fumigation. The work should be performed by responsible and experienced persons.

GOPHER POISON.

The more common poison used to-day in the northwestern provinces for the destruction of gophers, is strychnine, though from our own experiments at Indian Head, Sask., and that of the Wyoming Experiment Station, carbon bisulphide is probably a more effective exterminator of these pests.

Carbon bisulphide is a highly inflammable liquid, with a very disagreeable smell. Though not corrosive, its vapor is detrimental to health when breathed in quantities. It, however, can be used without danger provided ordinary care is exercised—more especially in regard to flame and fire. The method of use is to saturate a small ball of rags or cotton waste with the bisulphide and thrust it into the fresh burrow in the evening, closing the mouth of the burrow with a little earth. Dry balls of horse manure have been used successfully instead of cotton waste. The fumes from the bisulphide are very heavy and sink down the burrow or tunnel, destroying the gophers by suffocation.

Strychnine is dangerous to live stock running loose and, moreover, it is difficult at times, when food is plentiful, to get the gophers to eat the poisoned grain. Strychnine is intensely bitter even in very dilute solutions and no doubt the gophers are often deterred from eating the grain by tasting the poison on the outside of wheat. For this reason, the poisoned wheat, while still damp, might be sprinkled with a little sugar.

In gopher-infested districts, solutions of strychnine are frequently distributed by municipalities to farmers, a certain strength or number of grains of strychnine per fluid ounce being stipulated. A number of such solutions have been forwarded

for examination to ascertain if they are equal to the guarantee. In the majority of instances these have been found of guaranteed strength, but in a few cases they have been weaker. We advise that on the labels, in addition to directions for use and the caution to be observed in its employment in order to avoid the poisoning of children and stock, the amount of strychnine per fluid ounce be stated.

Strychnine and strychnine sulphate are white, crystalline solids, but may be brought into solution by the addition of a few drops of acid or a little strong vinegar. Strychnine sulphate is fairly soluble and for this reason is, perhaps the better form to use, when the solution is not bought. In employing either of these substances, the poison should be entirely dissolved before covering the grain with the solution. All the samples of strychnine and strychnine sulphate (crystallized) submitted to analysis have been found pure. The quantity usually recommended is one ounce of strychnine to one bushel of wheat.

The wheat should be allowed to stand in the poison solution (of which there should be sufficient to cover the grain) for 36 hours, or until the grain is quite soft, showing thorough saturation with the poison. A teaspoonful placed at the mouth of each burrow should be ample.

We would again emphasize the necessity for the greatest care in the handling and use of this deadly poison, to avoid accident.

THE FERTILIZING VALUE OF RAIN AND SNOW.

The sixth year of this investigation, the object of which is to ascertain the possible enrichment of the soil, per acre, due to nitrogen compounds furnished by rain and snow, closed on February 28, 1913. The collection of the samples submitted to analysis has been made on the Central Experimental Farm, situated on the outskirts of Ottawa, and every precipitation of rain and snow that would yield a sufficiency for analysis from the catchment area employed has been chemically examined.*

In previous reports we have dealt at some length with the various factors that influence the nitrogen-content of the precipitation—and especially that of the rain. It may, therefore, suffice to enumerate the more important of these and to state briefly that the total amount of nitrogen so furnished per acre, per annum, has not been found to follow the total precipitation closely.

While the direction of the prevailing winds, considered apart from velocity during the falling of rain and snow, as for instance toward or from the city, does not apparently markedly influence the nitrogen content, its velocity or violence may and frequently does very appreciably affect the character of the rain in this respect. The rain during thunder storms is invariably rich in nitrogen, and this we have attributed chiefly to the presence of an increased amount of dust in the air, though to some extent the nitrates may be increased by the electric discharges (lightning flashes) of the storm. It has been repeatedly noted that the rain falling during or immediately following cyclonic storms of great severity and which 'filled' the atmosphere with dust particles, had an exceedingly high nitrogen-content, more particularly present as free and albuminoid ammonia.

Another factor and probably the most potent, is frequency of precipitation, and this is more particularly true during the summer months. A scanty rainfall after a period of hot, dry weather, is invariably rich and on the other hand the later collections after several days of showery weather show a rapidly decreasing nitrogen-content.

During the year March 1, 1912, to February 28, 1913, 107 samples were collected and analyzed, being fifteen more than the year previous.

* The catchment basin is approximately 60 by 30 inches, and is placed about 25 feet from the ground, which, for some distance around, is in lawn and shrubbery.

The principal data for the year are recorded in the following table, comprising monthly totals of precipitation, the average nitrogen-content for the month expressed as 'free' and 'albuminoid' ammonia and as 'nitrates' and 'nitrites.' The last column gives the pounds of nitrogen, so supplied, per acre.

Rain and Snow at Ottawa for the Year ending February 28, 1913.

Month and Year.	Precipitation in Inches.			Nitrogen.				Pounds of Nitrogen per acre.
	Rain.	Snow.	Total in Inches of Rain.	In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Total.	
1912.				p.p.m.	p.p.m.	p.p.m.	p.p.m.	
March	......	14·00	1·40	·29	·07	·11	·47	·149
April	2·60	2·00	2·80	·79	·28	·21	1·28	·815
May	5·15	....	5·15	·61	·04	·26	·91	1·062
June	1·35	....	1·35	·55	·14	·34	1·03	·315
July	3·89	....	3·89	·34	·06	·30	·70	·617
August	4·94	....	4·94	·31	·07	·17	·55	·616
September	4·01	....	4·01	·39	·10	·18	·67	·609
October	2·47	....	2·47	·37	·09	·18	·64	·358
November	2·59	23·00	4·89	·38	·07	·13	·58	·642
December	1·17	10·00	2·17	·31	·29	·32	·92	·452
1913.								
January	2·17	23·75	4·54	·21	·07	·05	·33	·339
February	......	23·50	2·35	·13	·06	·13	·32	·170
	30·34	96·25	39·96	....	....	....	....	6·144

Attention may be directed to the more salient features in the foregoing table and one or two comparisons made with similar data from previous years. The total precipitation, 39·96 inches, is considerably higher than that recorded since the beginning of the investigation, 1907, and exceeds that of the average for 22 years by practically 5½ inches. As the snowfall for the year was practically normal, it necessarily follows that the increased precipitation was as rain, which was considerably heavier in May, August and September. The rainfall of 2·17 inches during January may be quoted as exceptional, and this serves to explain the larger amount of nitrogen for that month than has usually been found.

The total nitrogen for the year amounted to 6·144 pounds—an amount practically identical with that of the preceding year and, excepting the year ending February, 1909, when the results were abnormally high owing to bush fires, ·403 pounds, above the average for the period of investigation February, 1907, to February, 1913.

The precipitation data and amount of nitrogen per acre for the past six years are given in the following table:—

PRECIPITATION and Amount of Nitrogen per Acre, Ottawa, 1908-1913.

	Rain in Inches.	Snow in Inches.	Total precipation in Inches.	Pounds of Nitrogen per Acre.
Year ending February 29, 1908	24·05	133·00	37·35	4·332
" " " 28, 1909	22·99	96·25	32·63	8·364
" " " 28, 1910	28·79	80·75	36·87	6·869
" " " 28, 1911	19·67	73·00	26·97	5·271
" " " 29, 1912	20·33	104·25	30·76	6·100
" " " 28, 1913	30·34	96·25	39·96	6·144
Average for 22 years	25·23	92·36	34·47	....

It is interesting to note that the proportions of the total nitrogen furnished by the rain and snow respectively have remained practically constant for the past four years, and it would seem that, for the precipitation at Ottawa, somewhat more than eight-tenths of the nitrogen is to be found in the rain. For the past year, we have 5·113 pounds nitrogen, or 83 per cent of the whole, in the rain, and 1·031 pounds, or 17 per cent, in the snow. For the period 1908-1913, the data are given in tabulated form as follows:—

AMOUNTS of Nitrogen furnished by Rain and Snow.

	Total.	By Rain.		By Snow.	
		Pounds.	Proportion.	Pounds.	Proportion.
	Lb		per cent.		per cent.
Year ending February 29, 1908	4·322	3·243	75	1·080	25*
" " " 28, 1909	8·364	7·528	90†	·836	10
" " " 28, 1910	6·869	5·83	85	1·04	15
" " " 28, 1911	5·271	4·424	84	·847	16
" " " 29, 1912	6·100	5·075	83	1·025	17
" " " 28, 1913	6·144	5·113	83	1·031	17

* Snowfall exceptionally heavy.
† Rain abnormally rich in ammonia due to bush fires.

Considering the distribution or proportion of the various nitrogen compounds, the results of the past year are in close accord with those previously obtained; of the total nitrogen, 6·144 pounds, it will be observed 4·434 pounds, or 72 per cent, were present as free and organic ammonia, and 1·710 pounds, or 28 per cent, as nitrates and nitrites.

The results in the following table are of interest in showing the greater richness of the rain and the proportions of the several nitrogen compounds as present in both rain and snow:—

AVERAGE Nitrogen-Content of Rain and Snow.

(Amount of Nitrogen per acre, as Free and Albuminoid Ammonia and as Nitrates and Nitrites.)

	Number of Samples Analyzed.	Precipitation in Inches.	NITROGEN.								
			Parts per Million.				Percentage of Total.			Per Acre.	
			In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Total.	In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	As Free and Albuminoid Ammonia.	As Nitrates and Nitrites.
Rain..	85	30·34	.409	.129	.216	.744	55	16	29	3.630	1.483
Snow..	22	96·25	.265	.104	.104	.473	56	22	22	.804	.227

The rain and snow in falling through the atmosphere exert a cleansing action, washing out and filtering out many impurities, both gaseous and solid. This function of the precipitation undoubtedly has an important hygienic bearing but, further, as we have seen, it furnishes the soil with a notable amount of that most important and most costly of all plant foods, nitrogen, in a condition immediately available for crop use. Among the many useful ways in which the rain and snow affect agriculture, this role in which they act as fertilizing agents must not be overlooked. From the data of this investigation it would appear that the manurial value of the rain and snow, at current prices of nitrogen in fertilizers, would be almost $1 per acre, annually.

THE WATER SUPPLY OF FARM HOMESTEADS.

There ought to be little necessity nowadays to urge upon farmers the desirability of a pure water supply, for in recent years there are few subjects that have received more attention in the agricultural press and in the literature issued by authorities on hygiene. The relation generally of water to health, the fact that there are certain diseases, more or less prevalent in rural parts as in cities, and which are frequently epidemic in character, that are essentially water-borne, constitutes knowledge that should be in the possession of all. Nevertheless, a survey of present conditions on the average farm and the outbreaks of typhoid fever that still occur from time to time on farms, in villages, assure us that it is incumbent to continue our propaganda again and again, to bring before our people the danger to health in using a polluted water supply. For twenty-five years, the Chemical Division of the Dominion Experimental Farms has taken an active part, not only in the dissemination of information regarding the importance of pure water to the good health of the farmer and his family and the thriftiness of his stock, but in examining and reporting upon such samples of well waters as may be submitted according to directions for collection, etc., obtainable upon application. Many have availed themselves of this privilege and during that period many hundreds, probably thousands, of samples from farm homesteads have been analyzed. But the work must be continued and extended, for we feel assured that there still remains a very large number of farmers who as yet have not fully realized the importance of pure water and who, by reason of an improperly

located well and disregard of hygienic principles, are using water of very doubtful quality.

We have enlarged from time to time in the annual report of the Division, and elsewhere, upon the great risk of pollution that follows when the well, usually quite shallow and drawing merely on the ground water of the immediate environment, is located in the barnyard, near the farm buildings, or otherwise in the proximity to sources of contamination. Unfortunately, such wells are only too common. Convenience has been secured but health jeopardized; in too many instances the results has been polluted water, a water that is a serious menace to good health. We take the position that such wells should be abandoned at the earliest possible moment and that, until a purer supply is available, there should be no neglect in boiling all the water required for drinking and culinary use. Boiling will not make bad water good, but it will make it reasonably safe as regards the possible dissemination of infective disease germs. When the location of the shallow well is satisfactory from the hygienic standpoint it may yield a good water, and a safeguard of considerable value may be adopted by keeping an area of say fifty yards radius around the well free from manure and all kinds of filth (preferably this area should be sod) and by lining the well, say to a depth of ten feet from the surface, with puddled clay or concrete. This lining may be from six to twelve inches thick and should project some twelve inches above the mouth of the well to preclude the entrance of surface wash. The impervious lining ensures that all water entering the well shall pass through at least a certain layer of soil that is able to perform its function as a natural filter.

Next in order is the bored or driven well, obtaining its supply from a deep seated source, the well being sunk through one or more layers of impervious rock until a water-carrying stratum is reached. Such wells constructed so that not only is surface water excluded but that there is also a perfect sealing where the pipe enters the solid rock, are strongly advocated and it is gratifying to be able to record they are replacing the shallow, ground-water well on Canadian farms. Ordinarily they yield a water of good quality and quite palatable, though one perhaps not quite so suitable for certain domestic purposes as the softer water from shallow wells. Occasionally the salinity is high, especially from the presence of sulphates, but in most districts the water is seldom non-potable from this cause. But it must not be supposed that the bored well is always and necessarily free from organic impurity; instances have come under our notice in which the presence of drainage matter has been shown both by chemical and bacteriological examination. The pollution may have arisen from faulty sealing where the pipe enters the rock, or, as is more frequently the case, by the passage of the pipe through a shaly rock or one full of fissures which allowed the downward flow of surface water without exerting any purifying influence thereon.

Provided the farmer has found by such means an ample and good supply, a pump may be installed, actuated by windmill, small gasoline or hot-air engines and the water piped to tanks in the house and barns. The convenience, comfort and economy in labour of such a service, in addition to the value to be placed upon a wholesome supply, make it one ideal for the rural home and well worth the cost of installation. It permits not only a constant supply of water in the kitchen but the putting in of a bath-room and the disposal of sewage by the septic tank system—modern conveniences which undoubtedly tend to better health conditions.

We must add one word of caution as to the judging of water by the farmer from its appearance, its temperature and its odour or absence of odour. Usually, if a water is not objectionable to sight and smell it is considered satisfactory. A water may be clear and sparkling, very cool and odourless and yet be most seriously polluted. Therefore, reliance should not be implicitly placed upon these characteristics, though they are those which all good waters should possess.

In the appended table, we give the analytical data and a very brief report upon 188 samples of water from various parts of the Dominion, examined during the past year. Of these eighty-nine have been pronounced as pure and wholesome, forty-three as suspicious and probably dangerous and forty-one as seriously contaminated. There were fifteen too saline for use as a potable supply.

Farmers desiring an examination of their water supply are invited to send for a copy of the directions to be followed in the collection and shipment of the sample. Samples are being constantly received at the laboratories which, owing to insufficiency in quantity, dirty containers or corks, or other causes, cannot be submitted to analysis; trouble and expense to the farmer will therefore be saved if these instructions are first obtained and faithfully carried out.

ANALYSES OF WELL WATERS, 1912-13.

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.		Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
1	Bedford, Que.	T. G. G.	Apr.	3	·88	·13	2·48	17·5	280·0	196·4	83·6	Free.	Polluted.
2	Ironsides, Que.	A.F.D.	"	9	·49	·11	6·19	140·0	620·0	384·0	236·0	Heavy.	Contaminated.
3	Coquitlam Lake, B.C.	R.S.S., No. 63	"	10	Free.	·01	Trace.	Trace.	14·2	5·0	9·2	Free.	Pure and wholesome.
4	"	" No. 64	"	10	"	·02	"	Free.	18·4	6·8	9·6	"	" "
5	"	" No. 65	"	10	"	·03	"	"	18·4	8·0	10·4	"	" "
6	Southport. P.E.I.	P.C.	"	11	·03	·05	1·90	35·0	192·8	126·0	66·8	"	Suspicious.
7	Wynyard, Sask.	J.P.	"	12	·03	·24	·51	15·0	1688·0	1333·6	354·4	Trace.	Very suspicious.
8	North Thompson, Kamloops, B.C.	E.H.J.	"	20	·14	Trace.	Free.	2·5	376·0	280·0	96·0	Free.	Wholesome.
9	Banff, Alta.	J.B.H.	"	25	Free.	·02	"	Trace.	266·0	214·8	51·2	"	Exceptionally pure.
10	Kelowna, B.C.	N.P.C.	May	2	Trace.	·18	"	6·0	622·4	452·8	169·6	"	Wholesome.
11	Blakeney, Ont.	B.Wr.Co.	"	3	·64	10	"	29·0	400·0	301·6	98·4	Trace.	Contaminated.
12	Ottawa, Ont.	R.P.C.	"	3	Free.	Trace.	.03	13·5	404·8	260·0	144·8	Free.	Suspicious.
13	St. Hyacinthe, Que.	S.P.M.	"	10	·35	·05	Free.	90·0	586·4	452·8	133·6	F. trace.	Very suspicious.
14	Coquitlam Lake, B.C.	R.S.S., No. 66	"	10	Free.	·06	·05	Free.	20·0	7·0	18·0	Free.	Wholesome.
15	"	" No. 67	"	10	Trace.	·06	·05	"	23·2	10·8	12·4	"	"
16	"	" No. 68	"	10	"	·04	·03	"	13.0	4·0	9·0	"	"
17	"	" No. 69	"	10	"	·03	·02	"	12·6	8·6	4·0	"	"
18	Allensville, Muskoka, O.	J.H.McN.	"	13	·43	·64	1·86	30·0	344·0	194·0	150·0	F. trace.	Seriously polluted.
19	Wycollar, Sask.	H.H.C.	"	14	Free.	·48	Free.	·22	2926·0	2285·0	641·0	Free.	Saline.
20	Bealton, Ont.	A.K.	"	17	"	·02	2·74	50·0	2262·0	1788·0	474·0	"	Polluted.
21	Hamilton, Ont.	J.C., No. 1	"	17	"	·05	Free.	16·0	518·0	432·0	86·0	"	Pure and wholesome.
22	"	" No. 2	"	17	·03	·05	·02	30·0	954·0	802·0	152·0	"	Suspicious.
23	Orillia, Ont.	S.D.McA.	"	22	·27	·13	Free.	5·5	323·2	240·0	83·2	F. trace.	Very suspicious.
24	Banff, Alta.	J.B.H.	"	29	Free.	·01	"	Free.	217·3	165·2	52·1	Free.	Exceptionally pure.
25	Rock Lake.	A.W.F.	June	4	Free.	·38	"	2·5	158·0	100·0	58·0	F. trace.	Wholesome.
26	Butler, Man.	J.C.W.	"	5	1·68	·04	"	140·0	1328·0	1210·0	118·0	Trace.	Suspicious.
27	Coquitlam Lake, B.C.	R.S., No. 70	"	7	F. trace.	·06	·03	F. trace.	13·0	5·6	7·4	Free.	Wholesome.
28	"	" No. 71	"	7	Free.	·04	·02	F. trace.	16·0	4·0	12·0	Free.	Wholesome.
29	"	" No. 72	"	7	Trace.	·02	·03	"	15·0	3·0	12·0	"	"
30	"	" No. 73	"	7	F. trace.	·02	·03	"	24·0	10·0	14·0	"	"
31	St. Catharines, Ont.	T.M.K.	"	19	Free.	·11	·73	14·0	194·0	120·0	74·0	"	Suspicious.
32	Rosthern, Sask.	F.T.S.	"	20	3·58	·10	·58	45·5	3168·0	2755·2	412·8	Hy. trace.	Polluted.
33	"	G.B.	"	20	4·54	·10	Free.	45·0	2994·0	2548·0	446·0	" "	"
34	"	W.A.M.	"	20	·06	Trace	·05	5·5	368·0	282·8	85·2	Free.	Suspicious.

ANALYSES OF WELL WATERS, 1912-13—*Continued.*

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.		Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
35	Crystal City, Man	G.D.A.E.	June	22	Free.	·12	Free.	2·5	332·0	224·0	108·0	"	Wholesome.
36	St. John, N.B.	T.S.S.	"	22	"	·02	2·15	45·0	408·0	234·0	174·0	Heavy	"
37	St. Grégoire, Que	L.H.	"	25	2·56	·20	·30	300·0	4935·0	4360·0	575·0	F. trace	Saline.
38	Rock Lake	A.W.F.	"	26	Free.	·10	·26	·5	138·0	92·0	46·0	Free	Free from pollution.
39	St. Marcel, Que	G.P.	July	2	"	Free.	3·04	4·0	152·0	104·0	48·0	Trace	Contaminated.
40	Loggieville, N.B.	A.B.M.	"	2	5·80	1·24	4·46	120·0	518·0	316·0	202·0	Hy. trace	Seriously polluted.
41	Banff, Alta	J.B.H.	"	2	Free.	Free	·03	1·5	156·0	128·0	28·0	Free	Free from pollution.
42	Berton, Man.	B.J.C.	"	2	"	·08	7·85	50·0	960·0	566·0	394·0	F. trace	Contaminated.
43	Glen Adelaide, Sask	G.A.H.	"	3	1·84	·04	Free.	37·0	3534·0	2956·0	578·0	Free	Saline.
44	Innerkip, Ont	F.M.C.	"	4	Free.	Free.	·53	Free.	315·0	245·0	70·0	Trace	Wholesome.
45	Ottawa, Ont	J.R.B. No. 1	"	8	"	·02	1·06	4·5	218·0	188·0	30·0	F. trace	Suspicious.
46	"	" No. 2	"	8	·12	·34	Free.	7·5	323·2	260·0	63·2	Free	Polluted.
47	Spanish, Ont	J.P.	"	9	·04	·14	"	1·5	169·6	142·0	27·6	"	Free from pollution.
48	Loughead, Alta	A.E.B.	"	9	1·70	·10	"	5·0	1340·0	1280·0	60·0	F. trace	Suspicious.
49	Coquitlam Lake, B.C.	R.S. No. 74	"	10	·08	·08	"	Free.	16·0	9·0	7·0	Free	Wholesome.
50	"	" No. 75	"	10	Free.	·02	·01	"	19·0	10·0	9·0	"	"
51	"	" No. 76	"	10	"	·04	Trace.	"	12·0	6·0	6·0	"	"
52	St. Grégoire, Que	L.H.	"	11	3·30	·06	Free.	275·0	4932·0	4392·0	540·0	"	Saline.
53	Ironsides, Que	A.F.D.	"	11	Free.	·08	10·43	165·0	852·0	508·0	344·0	Trace	Very suspicious.
54	Ottawa West, Ont.	W.H.T.	"	13	"	·02	·99	·8.0	368·0	....	....	Free	Prob. free f. contamination.
55	Piapot, Sask	C.A.L.	"	16	"	Free.	Free.	7·0	350·0	255·0	95·0	"	Pure and wholesome.
56	C.E.F., Ottawa, Ont	C.S.	"	22	"	·02	1·15	7·0	324·0	274·0	50·0	"	Wholesome.
57	Merrivale, Ont	Rev. T. P.C.	"	22	"	·08	8·65	17·5	458·0	376·0	82·0	"	Contaminated.
58	Ottawa, Ont	O.D. No. 1	"	23	·03	·14	·66	17·0	428·0	338·0	90·0	"	Suspicious.
59	"	" No. 2	"	23	Free.	·03	·79	17·0	414·0	286·0	128·0	"	"
60	Vankleek Hill, Ont	N.B.	"	23	5·14	·08	1·70	6250·0	17344·0	9676·0	7668·0	"	Saline.
61	Oakwood, Ont	W.T.G.	"	23	·14	·11	6·92	94·0	800·0	644·0	156·0	"	Contaminated.
62	Ottawa, Ont	J.S.	"	23	Free.	·05	·03	2·0	140·0	104·0	36·0	"	Free from contamination.
63	Chelsea, Que	A.G.	"	24	"	·08	2·97	8·5	40·0	8·0	32·0	"	Suspicious.
64	Westboro, Ont	J.A.L.	"	24	"	·04	....	3·0	270·0	200·0	70·0	Trace	Free from pollution.
65	Ottawa, Ont	A.McN.	"	30	"	·06	4·16	18·0	440·0	320·0	120·0	V. heavy	Suspicious.
66	Woodstock, Ont	J.R.B.	"	30	"	·08	1·77	14·0	356·0	240·0	116·0	Free	Very suspicious.
67	Billings Bridge, Ont	F.T.W.	"	31	·20	·12	·99	26·0	260·0	236·0	24·0	"	Polluted.
68	Chelsea, Que	A.G.	Aug.	1	Free.	·02	2·10	9·0	60·0	....	60·0	V. heavy	Contaminated.
69	Ottawa, Ont	T.P.R.	"	1	1·20	·15	Free.	8·5	204·0	102·0	102·0	Heavy	"

70	Old Chelsea, Que	P.M.G.	"	2	Free.	·32	Trace.	3·5	244·0	170·8	73·2	Free	Free from contamination.
71	Nepean Tp. Ont	J.R.B.	"	2	·07	·06	Free.	4·5	280·0	200·0	80·0	"	Unpolluted.
72	Banff, Alta	J.B.H.	"	7	Free.	·03	"	1·0	186·0	156·0	30·0	"	Excellent.
73	City View, Ont	J.C.	"	7	·08	·06	1·85	16·5	398·0	266·0	132·0	Trace	Suspicious.
74	Duck Cove, N.B.	J.S.	"	8	·03	·02	·37	18·0	148·0	112·0	36·0	Free	Free from organic pollution.
75	Cypress River, Man	R.O.	"	8	4·40	·08	Free.	1900·0	3392·0	2968·0	424·0	"	Saline.
76	Coquitlam Lake, B.C.	R.S. No. 77	"	8	F. trace.	·06	"	1·0	29·0	17·0	12·0	"	Wholesome.
77	" "	" " 78	"	8	"	·03	"	1·0	35·6	22·6	13·0	"	"
78	" "	" " 79	"	8	Free.	·03	"	·5	23·0	10·0	13·0	"	"
79	Ottawa South, Ont	W.T.G.	"	9	"	·02	10·06	24·0	488·0	360·0	128·0	Trace	Contaminated.
80	North Lancaster, Ont	L.K.R.	"	9	·72	·08	Free.	82·0	558·0	438·0	120·0	"	Seriously contaminated.
81	Carp, Ont	G.H.G.	"	9	·03	·10	3·42	10·5	258·0	132·0	126·0	Free	Suspicious.
82	" "	"	"	9	·09	·02	·28	13·5	326·0	222·0	104·0	Trace	"
83	Billings Bridge, Ont	H.W.M.	"	9	·80	·05	Free.	32·0	268·0	234·0	34·0	"	"
84	North Gower, Ont	G.E.C.	"	10	Free.	·10	5·45	110·0	650·0	502·0	148·0	"	Polluted.
85	Navan, Ont	M.R.	"	12	·40	·06	Free.	23·5	272·0	192·0	80·0	"	Very suspicious.
86	East St. John, N.B.	H.W.P.	"	12	Free.	·05	"	9·0	122·0	92·0	30·0	F. trace	Pure and wholesome.
87	Glen Bryan, Sask.	G.T.W.	"	12	·06	·44	"	100·0	10262·0	8792·0	1170·0	Free	Saline.
88	Billings Bridge, Ont	H.W.M.	"	13	·77	·05	"	32·0	374·0	326·0	48·0	F. trace	Polluted.
89	Ottawa, Ont	P.W.McC.	"	13	5·00	·13	6·60	54·0	710·0	562·0	148·0	"	"
90	" "	H.C.	"	14	Free.	·13	·07	225·0	756·0	568·0	188·0	Trace	Suspicious.
91	Arnprior, Ont	H.E.M.	"	15	6·34	·12	Free.	3000·0	4876·0	4644·0	232·0	"	Very suspicious.
92	Billings Bridge, Ont	R.S.R.	"	15	·42	·04	4·80	20·0	392·0	334·0	58·0	Free	Polluted.
93	Duval, Sask	H.A.B.	"	15	1·74	·05	·38	22·5	3396·0	2916·0	480·0	Trace	Saline.
94	Kazabazua, Que	R.J.	"	22	.03	·44	·01	Free.	175·2	133·6	41·6	Trace	Free from pollution.
95	Slager, Sask	E.T.S.	"	22	2·58	·18	·06	600·0	3286·0	3114·0	172·0	"	Saline.
96	Rockliffe, Ont	A.C.	"	22	·14	Trace.	·07	3·8	364·0	314·4	49·6	Sl. trace	Suspicious.
97	Mountain Road, Hull, P.Q.	N.T.	"	22	Free.	·08	·99	7·6	346·4	308·0	38·4	" "	Pure and wholesome.
98	Nappan, N.S.	R.R.	"	24	·16	·20	·24	5·0	49·6	47·3	2·3	" "	" "
99	" "	"	"	24	01	·01	·04	5·5	36·8	32·8	4·0	Free	" "
100	North Gower, Ont	J.E.C. No 1	"	28	·11	·06	3·01	90·0	541·0	450·0	91·0	Sl. trace	Contaminated.
101	" " "	" No 2	"	28	·03	·06	4·49	86·0	523·0	398·0	125·0	Free	"
102	Laurentian View, Ont	A.C.M.S.	"	28	·05	·05	9·14	7·0	172·0	135·2	36·8	V-S. trace	"
103	Westboro, Ont	C.O.	"	29	·01	·02	5·75	7·0	385·2	266·0	19·2	Free	Free from pollution.
104	Ottawa W., Ont	S.V.	"	30	·04	·03	·07	2·0	263·2	222·0	41·2	"	Pure and wholesome.
105	North Lancaster, Ont	L.R.	"	30	·98	·36	Free.	86·0	596·8	488·8	108·0	"	Seriously contaminated.
106	Coquitlam Lake, B.C.	R.S. No 80	Sept.	5	·01	·03	·02	Free.	40·0	23·0	17·0	"	Wholesome.
107	" " "	" No 81	"	5	·02	·01	Free.	"	37·4	25·4	12·0	"	"
108	Carp, Ont	G.H.G.	"	5	·04	Free.	"	18·0	274·0	226·0	48·0	Heavy	Free from pollution.
109	Lundbreck, Alta	J.L.P.	"	12	10	·16	"	650·0	2323·0	2240·0	83·0	"	Saline.
110	Nappan, N.S.	R.R. No 1	"	14	·08	·03	·14	5·5	48·8	28·8	20·0	Free	Pure and wholesome.
111	" "	" No 2	"	14	Free.	·02	·02	5·5	56·0	36·0	20·0	"	" "
112	New Liskeard, Ont	J.E.M.	"	16	·06	·02	Free.	2·0	266·0	210·0	56·0	"	Free from contamination.
113	Banff, Alta	B.W.W.	"	18	Free.	·02	·05	·5	188·0	152·0	36·0	"	Unpolluted.
114	Rockliffe, Ont	C.C. No 1	"	19	"	·02	·03	5·0	240·0	194·0	46·0	"	"
115	" "	" No 2	"	19	·02	·01	78	10·5	356·0	272·0	84·0	"	Suspicious.
116	Mara, B.C.	R.J.D.	"	19	Free.	·14	Free.	·5	90·0	58·0	32·0	"	Unpolluted.
117	Lennoxville, Que	A.B.	"	21	1·68	·30	5·21	22·5	386·0	234·8	151.2	"	Seriously polluted.
118	Three Rivers, Que	A.E.D.	"	25	Free.	·10	2·36	6·0	80·0	20·0	60·0	"	Very suspicious.
119	Carp, Ont	O.M.G.	"	30	05	·16	5·60	20·0	484·0	292·0	192·0	Trace	Seriously contaminated.

ANALYSES OF WELL WATERS, 1912-13—*Concluded.*

Results Stated in Parts per Million.

Number.	Locality.	Marks.	Date.		Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
120	St. Thérèse, Que	A.P. No 1	Oct.	3	·08	·12	8·45	24·0	348·8	280·0	68·8	Free	Contaminated.
121	" "	" No 2	"	3	·08	·11	4·26	19·0	258·4	204·0	54·4	"	"
122	St. John, N.B.	G.U.H.	"	5	1·12	·36	Free	16·0	207·0	134·0	73·0	"	Seriously contaminated.
123	Loggieville, N.B.	A.P.H	"	5	·10	·05	"	9·0	110·8	82·0	28·8	"	Very suspicious.
124	The Lodge, N.S.	A.V.	"	8	Free.	·40	"	13·0	113·6	32·8	80·8	"	Unpolluted.
125	Coquitlam Lake, B.C.	R.S. No 82	"	8	·09	·06	"	1·0	26·8	14·6	12·2	"	Wholesome.
126	" " "	" No 83	"	8	·01	·06	"	·7	20·0	11·6	8·4	"	"
127	" " "	" No 84	"	8	Free.	·03	"	Free.	24·0	12·8	11·2	"	"
128	Ariss, Ont.	T.G.	"	10	·43	·12	"	2·5	456·8	390·0	66·8	"	Seriously contaminated.
129	Ottawa, Ont.	T.J.	"	22	Free.	·01	1·35	2·5	290·0	243·0	47·0	"	Very suspicious.
130	Oxbow, Sask	J.W.	"	24	1·26	·09	Free.	220·0	1980·4	1742·0	238·4	F. trace	Polluted.
131	Salt Spring Island, B.C.	J.C.L, No. 1	"	24	Free.	·30	"	350·0	1069·2	988·0	81·2	"	Free from organic pollution.
132	" "	" " 2	"	24	·44	·04	"	1000·0	2476·8	2377·6	99·2	"	Saline.
133	Salisbury, N.B.	J.W.C.	"	29	·12	·12	7·0	150·0	738·0	574·0	164·0	Free.	Polluted.
134	St. John, N.B.	G.H.B.	"	29	Free.	·01	1·58	7·0	78·8	48·0	30·8	"	Suspicious.
135	Hull, Que.	W.B., No. 1	"	31	·08	·12	·02	....	332·0	112·0	220·0	Heavy	Very suspicious.
136	"	" " 2	"	31	·06	·16	·03	2·0	200·0	128·0	72·0	Free	Suspicious.
137	Coquitlam Lake, B.C.	R.S., No. 85	Nov.	6	·03	·04	·04	·5	35·0	23·6	11·4	"	Wholesome.
138	" "	" " 86	"	6	trace.	·01	·03	·3	24·0	14·0	10·0	"	"
139	" "	" " 87	"	6	F. trace.	·01	·04	Free.	17·4	9·4	8·0	"	"
140	Meota, Sask	J.A.R	"	7	·01	·30	·12	400·0	4965·6	4214·4	751·2	Trace.	Saline.
141	Frelighsburg, Que.	F.A.A.	"	11	Trace.	·06	·20	Free.	164·0	129·2	39·8	Free	Free from pollution.
142	Jumping Pound, Alta.	N.B. Co.	"	11	Free.	·18	Free.	3·0	492·0	362·0	130·0	"	" "
143	Portsmouth, Ont	H.E.B.	"	14	·09	·10	4·55	2250·0	5742·5	3570·0	1172·5	Trace.	Saline.
144	Salmon Arm, B.C.	B.S.	"	14	Free.	·05	Trace.	1·5	582·0	440·0	142·0	Free.	Pure and wholesome.
145	Russell, Ont.	S.S.	"	22	·77	·58	·28	170·0	740·0	588·0	152·0	Trace.	Polluted.
146	Beauséjour, Man	J.H.	Dec.	3	·18	·28	6·09	185·0	1130·8	646·8	484·0	Free.	Contaminated.
147	Metchosin, B.C.	J.D.R.	"	3	·12	·08	·03	9·0	98·0	60·0	38·0	Trace.	Suspicious.
148	Strathroy, Ont	A.P.D.	"	6	·63	·12	7·37	9·0	381·6	94·8	86·8	"	Seriously polluted.
149	Coquitlam Lake, B.C.	R.S., No. 88	"	12	·01	·06	·09	1·0	37·4	25·6	11·8	Free.	Wholesome.
150	" "	" " 89	"	12	·01	·03	·03	Free.	35·0	21·6	13·4	"	"
151	" "	" " 90	"	12	·01	·03	·03	"	27·0	16·6	10·4	"	"
152	North Augusta, Ont	T.W.R.	"	13	·17	·03	Free.	11·0	282·4	207·6	74·8	"	Suspicious.
153	Ottawa, Ont.	D.G.G., No. 1	"	17	Free.	·12	"	Free	98·0	70·0	28·0	"	"
154	"	" " 2	"	17	·18	·08	·58	12·0	226·0	168·0	58·0	"	Contaminated.

155	Finch, Ont	J.A.R	"	17	·02	·04	Free.	150·0	630·0	498·0	132·0	"	Pure and wholesome.
156	Eastview, Ont	A.C	"	18	Free.	·09	1·91	20·5	396·8	358·4	38·4	Trace	Contaminated.
157	Riverside Park, Ont	W.G.M	"	21	"	·10	·10	3·5	378·8	351·6	27·2	"	Safe and wholesome.
158	Rose Lynn, Alta	A.R	"	26	"	·06	·02	2·6	333·0	274·0	59·0	Free	Wholesome.
159	Creston, B.C	G.L	"	26	1·54	·17	Free.	84·0	5079·0	4703·0	376·0	"	Saline.
160	Elston, Sask	"	Jan.	2	0·4	·10	"	3·5	516·0	447·0	69·0	F. trace	Free from pollution.
161	Chelsea, Que	D.G.G, No. 1	"	3	Free.	·16	"	Free.	53·2	21·2	32·0	Free	Pure and wholesome.
162	"	" " 2	"	3	"	·04	·23	2·5	160·0	131·2	28·8	"	Free from contamination.
163	Finch, Ont	J.A.R	Jan.	11	·04	·04	·03	140·0	620·0	444·0	176·0	Free	Free from organic impurities.
164	Coquitlam Lake, B.C	R.S. No. 92	"	22	·01	·06	·02	1·0	15·6	8·0	7·6	"	Wholesome.
165	" "	" No. 93	"	22	·01	·04	·02	Free	17·0	10·6	6·4	"	"
166	Ottawa, Ont	W. McA	"	29	·10	·04	·58	16·0	393·0	277·0	116·0	"	Very suspicious.
167	Dana, Sask	A.T	Feb.	3	·05	·21	·28	16·0	6346·8	5010·8	1336·0	"	Saline.
168	Harbord, Ont	T.M.M	"	11	Free.	·05	1·49	25·0	480·0	280·0	200·0	"	Very suspicious.
169	Coquitlam Lake, B.C	R.S. No. 94	"	15	·02	·08	·04	1·5	22·8	13·2	9·6	"	Wholesome.
170	" "	" No. 95	"	15	Free.	·04	·03	·3	19·6	11·4	8·2	"	"
171	Bowesville, Ont	C.G.H	"	19	"	·03	·01	1·5	254·0	180·0	74·0	"	Pure and wholesome.
172	Harbord, Ont	T.M.M	"	20	·12	·04	Free.	3·0	312·0	258·4	53·6	"	Suspicious.
173	Fredericton, N.B	W.W.H. No. 1	"	20	Trace.	·03	·17	·25	77·6	40·8	36·8	"	Wholesome.
174	" "	" No. 2	"	20	Free.	·01	2·54	7·0	80·0	64·0	16·0	"	"
175	" "	" No. 3	"	20	"	·03	·20	2·5	54·8	34·8	20·0	"	"
176	" "	" No. 4	"	20	"	·07	·08	1·0	26·8	12·8	14·0	"	"
177	" "	" No. 5	"	20	Trace.	·06	·07	2·0	29·4	12·0	17·4	"	"
178	" "	" No. 6	"	20	"	·03	·17	1·5	90·0	44·0	46·0	"	"
179	Ottawa, Ont	H.J.R	Mar.	3	Free.	·03	8·58	22·0	480·0	342·4	137·6	Trace	Suspicious.
180	St. Marc, Que	A.D	"	6	·62	·39	Free.	200·0	1172·4	1026·4	146·0	"	Seriously contaminated.
181	Upper Sackville, N.B	C.F.F. No. 1	"	6	Free.	1·00	3·70	50·0	501·6	393·2	108·4	Heavy	Contaminated.
182	" " "	" No. 2	"	6	·32	·18	·40	10·0	73·2	40·0	33·2	Trace	Very suspicious.
183	Ottawa, Ont	C.M	"	7	Free.	·02	·56	16·5	398·0	307·2	90·8	Free	Suspicious.
184	Coquitlam Lake, B.C	R.S. No. 96	"	14	·01	·06	·06	1·0	24·4	14·0	10·4	"	Wholesome.
185	" "	" No. 97	"	14	·02	·03	·03	·5	41·0	27·0	14·0	"	"
186	Hawthorne, Ont	J.L.L	"	19	Free.	·07	3·30	7·0	211·6	146·8	64·8	Trace	Suspicious.
187	Hull, Que	N.T	"	20	·09	10	2·60	4·5	219·2	176·0	43·2	L. traces	"
188	St. Martin, N.B	A.E.S.H	"	22	·04	·20	·23	Free	60·4	26·8	33·6	Free	Pure and wholesome.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM

THE DIVISION OF HORTICULTURE

For the Year ending March 31, 1913

PREPARED BY

The Dominion Horticulturist, Central Farm, Ottawa. - - - - - - W. T. Macoun.

Superintendent—

- Experimental Station, Charlottetown, P.E.I. - - - - - - - - - J. A. Clark, B.S.A.
- Experimental Farm, Nappan, N.S. - - - - - - - - - - - - - - - R. Robertson.
- Experimental Station, Kentville, N.S. - - - - - - - - - - - - - W. S. Blair.
- Experimental Station, Ste. Anne de la Pocatière, Que. - - - Jos. Bégin.
- Experimental Station, Cap Rouge, Que. - - - - - - - - - - - - G. A. Langelier.
- Experimental Farm, Brandon, Man. - - - - - - - - - - - - - - W. C. McKillican, B.S.A.
- Experimental Farm, Indian Head, Sask. - - - - - - - - - - - Angus Mackay.
- Experimental Station, Rosthern, Sask. - - - - - - - - - - - - W. A. Munro, B.S.A.
- Experimental Station, Scott, Sask. - - - - - - - - - - - - - - - R. E. Everest, B.S.A.
- Experimental Station, Lethbridge, Alta. - - - - - - - - - - - W. H. Fairfield, M.S.
- Experimental Station, Lacombe, Alta. - - - - - - - - - - - - - G. H. Hutton, B.S.A.
- Experimental Farm, Agassiz, B.C. - - - - - - - - - - - - - - - P. H. Moore, B.S.A.

Experimentalists of Substations at Salmon Arm, B.C., Fort Vermilion, Grouard, Athabaska Landing and Forts Smith, Resolution and Providence, in northern Alberta.

REPORT FROM THE DIVISION OF HORTICULTURE.

OTTAWA, March 31, 1913.

J. H. GRISDALE, Esq., B.Agr.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the twenty-sixth Annual Report of the Horticultural Division, being the fifteenth since I became head of the Division.

Included herein will be found the reports which have been prepared by the Superintendents of the Experimental Farms and Stations at Nappan, N.S.; Kentville, N.S.; Charlottetown, P.E.I.; Ste. Anne de la Pocatière, Que.; Cap Rouge, Que.; Brandon, Man.; Indian Head, Sask.; Rosthern, Sask.; Scott, Sask.; Lethbridge, Alta.; Lacombe, Alta.; and Agassiz, B.C.; also a report prepared by Mr. Thos. A. Sharpe, Salmon Arm, B.C., of experiments conducted on his farm. There are also reports from the Sub-stations at Fort Vermilion, Peace River district; from Grouard, Lesser Slave Lake; Athabaska Landing, Fort Smith, Fort Providence, and Fort Resolution, all in Northern Alberta. There is also at the end of the report for Lacombe a list prepared by me of fruits, vegetables, useful and ornamental trees and shrubs, climbers, herbaceous perennials, and annuals recommended for the prairie provinces.

HORTICULTURAL DIVISION.

The area of land in the Horticultural Division at the Central Experimental Farm, Ottawa, is 99 acres, divided as follows:—

	Acres.
Fruits and vegetables	46
Forest belts	21
Ornamental grounds	30
Nursery and rose garden	2
Total	99

On this land are grown tree fruits, small fruits, vegetables, forest trees, and ornamental trees, shrubs and herbaceous plants in more or less permanent plantations and in nursery rows. The lawns are extensive and require much care to keep them in good condition. Owing to the large number of experiments in progress, the work involved in giving the necessary attention to them on this ninety-nine acres is very heavy compared with what it would be on the same area under commercial crops, where the labour involved could be reduced to a minimum.

SUBDIVISIONS OF THE WORK.

The Horticultural Division may at present be divided into five parts or heads under which most of the work falls. These are as follows:—

1. Pomology,
2. Vegetable gardening,
3. Ornamental gardening,
4. Plant breeding,
5. Correspondence and office work.

In addition to these, or rather included in them, is the work in connection with the branch Farms, the forest belts planted both for ornamental purposes and to test the rate of tree growth; meetings attended; publications; and visits to the horticultural districts for the purpose of studying conditions in different parts of Canada.

POMOLOGY.

Under pomology is included the study of varieties of fruits for the purpose of learning their relative merits in regard to yield, season, quality, and profit. It also includes the identification, classification, and description, as well as the propagation, planting, and care of fruits, with experiments in cultural methods, including spraying. The exhibition and judging of fruits may also be grouped under pomology.

During the past year, this part of the work has received much attention. Many varieties have been described in detail on cards, which are filed for future reference and compilation. Varieties which have been sent in for identification have been named, and the information sent to the correspondents. Many new varieties were propagated for test on the Central and Branch Farms and for trial in other places, and a number of new ones have been planted out at Ottawa.

Fruit was exhibited at the Provincial exhibition, Quebec; the Central Canada exhibition, Ottawa; and the annual meeting of the Society for Horticultural Science, at Cleveland, Ohio. Fruit was also judged at several places by officers of the Horticultural Division. The general care of the orchards at the Central Experimental Farm also involved much work.

VEGETABLE GARDENING.

This includes the testing of varieties of vegetables for comparison of their relative merits as regards season, yield, quality, etc.; the comparison of different strains of the same variety; cultural methods, and spraying; and the study of commercial methods, both in the field and under glass. In 1912, especial attention was paid to potatoes, peas, and tomatoes, though all the principal kinds of vegetables were under experiment.

ORNAMENTAL GARDENING.

Under ornamental gardening comes the culture of ornamental trees, shrubs, and herbaceous plants; the study of their individual characteristics, such as height, form, colouring, and season of bloom, so that information will be available to Canadians to enable them to plant their places in such a way that the trees, shrubs and herbaceous plants will blend or be contrasted with one another to form pleasing landscape effects. The education of the people by lectures and bulletins on ornamental gardening and the encouragement of the beautifying of home surroundings, so much needed in Canada, is also a part of ornamental gradening which received attention during the year. In addition, large collections of roses, irises, phloxes, pæonies, lilacs, gladioli, geraniums and other ornamental plants have been got together to study. There was a fine display of these at the Central Farm in 1912 and visitors were much interested in them and pleased with the ornamental grounds as a whole.

The forest belts, planting in which was begun in 1888, furnish interesting data on the relative growth of the different timber trees and the merits of mixing the species or planting them in blocks of one kind. The annual measurements of a number of trees were taken in 1912, as in previous years.

PLANT BREEDING.

The improvements of fruits, vegetables and ornamental plants by cross-breeding and selection and the study of the laws of inheritance in different kinds and varieties

Comparison of Varities of Lettuce to determine which remain in condition longest in Summer Weather, Central Experimental Farm, Ottawa.

of horticultural plants is, in brief, the field of work which is covered in plant breeding in the Horticultural Division. Up to comparatively recent years, Canada has had to depend almost entirely on other countries for her new varieties of fruits, vegetables, and ornamental plants, and while many of these succeed admirably in this country, it is felt that, if originated in a climate more nearly like where they are to be grown than has been the case in many instances in the past, those that show especial merit are likely to prove more useful than those introduced from climates very dissimilar. During the past twenty-five years, much attention has been paid to the breeding of horticultural plants at the Central Experimental Farm. Many varieties of hardy hybrid apples, crosses between the Siberian crab (*Pyrus baccata*) and the apple originated by Dr. Wm. Saunders, have already been introduced into the prairie provinces and have proven hardier than any previously tested there. Second crosses made by Dr. Saunders with more blood of the larger apples and having fruit of good marketable size were propagated in 1912 for introduction. Many varieties of apples of handsome appearance and good quality have originated in the Horticultural Division and the best of these have been sent out for test to different parts of Canada to compare with those already in the market. More than two hundred of these new sorts have been propagated, and eighty-two of the best, named.

A large number of seedling strawberries has been raised in the Horticultural Division, and some of the best are being propagated for introduction. Special attention is being paid to the development of early strains of vegetables which will be of great value in the colder districts of Canada as well as in the more temperate parts. Good progress was made in this work in 1912, and provision has been made for greater efforts in plant breeding in the future.

New varieties of black currants and raspberries of much merit, which were also originated by Dr. Saunders, have been introduced.

CORRESPONDENCE AND OFFICE WORK.

The correspondence and other office work of the Horticultural Division grows each year, and in 1912 the number of letters received and despatched was greater than ever before, the number of letters received being 5,820 and the number despatched 6,330. Of these, a large proportion required technical information, and it is believed that, through correspondence, much aid is being rendered to those interested in horticulture in Canada. People who ask for information by letter are those who are most likely to put into practice the advice given. As this correspondence comes from all parts of Canada it is necessary to become familiar with the conditions from north to south and from east to west throughout the Dominion.

The card index system installed last year in the Horticultural Division for the purpose of filing the records of the Central Farm and branch Farms and Stations has also entailed a large amount of work, but is proving a very satisfactory means of getting at the records, as it enables one rapidly to find what is desired. The books were sent from the branch Farms to Ottawa at the close of the growing season of 1912 and the records which it was desired to put on the cards were transferred.

BRANCH FARMS.

The work of the Horticultural Division in relation to the branch Farms and Stations has grown rapidly. It is its aim to aid the Superintendents in as many ways as possible and to help them develop the horticultural work on the Farms of which they have charge, and also to help to so systematize the work that the results will be made of the greatest value to the people of Canada. During the past year much has

been done in the directions above mentioned. Material, consisting of plants, seeds, labels, record books and other things, has been furnished the branch Farms and Stations through the Horticultural Division, as in previous years.

The Experimental Farm, Nappan, was visited by me on July 15, 1912, when the experimental work in horticulture was gone over with the Superintendent, and some suggestions made in regard to the keeping of records and of future work.

The Experimental Station, Charlottetown, P.E.I., was visited on July 16, 1912, for the same purpose, and notes were taken of matters which could be attended to by me for the Station. On July 18, I was at the Experimental Station, Kentville, N.S., and discussed with the Superintendent the situation of future plantations on the Farm, the positions of the roads through the horticultural part of the Farm, and the general plan of the planting.

In May, 1912, my assistant, Mr. T. G. Bunting, before the appointment of the Superintendent, went to the Kentville Station and planted about twenty-one acres of orchard with the trees which had been ordered by me the previous autumn.

I visited the Experimental Farm, Brandon, Man., on April 13 to 15, 1912, and again on August 29 to 30, 1912. A site was decided upon for a new bush fruit plantation, and the bushes were planted in the spring of 1912. It was also decided during my visit to remove every other box elder tree in the mixed avenue of this tree and white spruce, as the trees were crowding. The experimental work was discussed with the Superintendent and notes were made of things needful for the development of the horticultural work there.

My first visit to the Experimental Farm at Indian Head, Sask., in 1912 was on April 15 to 16, when I discussed with the Superintendent the horticultural experiments planned for the year, and planned the planting of the grounds near the Superintendent's house, the hedge which formerly enclosed the flower beds having been removed, at my suggestion, and the land ploughed and levelled in preparation for the planting of trees, shrubs, and flowers, and the making of a lawn. On August 28 to 29, when I made another visit, some further changes were planned, including the removal of every other tree in the avenue beginning at the entrance; the removal of trees and shrubs close to the Superintendent's house; the making of herbaceous borders to the west of the house and in the enclosure east of the house. It was also planned to remove the maples which formed a closely-planted avenue to the south of this enclosure. The experiments with fruits and vegetables were carefully gone over at this time.

I visited the Rosthern Experimental Station on April 28 to 30, 1912, and examined with the Superintendent the different plantations on the farm. I planned the arrangement of the sample hedges which were to be set out and did some further planting along the road leading from the entrance gate to the Superintendent's house. I was again at Rosthern on August 26 to 27, when perennial borders were planned, the arboretum borders gone carefully over, and many of the trees and shrubs named.

On April 24 to 27, 1912, I was at the Scott Experimental Station, where an addition of three acres to the orchard was planned; an arboretum for testing species and varieties of trees and shrubs was laid out, and also a long herbaceous border, extending from near the Superintendent's house to the railway. I also planned and did considerable planting on about five acres of lawn and ornamental grounds, and decided the arrangement of the sample hedges. The Scott Experimental Station was again visited on August 24, 1912, and notes were taken on horticultural experiments in progress.

The Experimental Station at Lethbridge, Alta., was visited on April 17 to 19, 1912, at which time I planted and assisted in the work of planting an area to be devoted to lawn and ornamental trees and shrubs west of the Superintendent's house. I also assisted in filling the vacancies in the arboretum with material from Ottawa,

and suggested—as I did also at the other branch Farms—the seeding down to grass of the land between the sample hedges, leaving a strip for cultivation close to the plants. The Lethbridge Station was again visited on August 19 to 21, 1912, and the experimental work in horticulture discussed with the Superintendent.

I spent April 20 to 23, 1912, at the Lacombe Experimental Station, and planned the planting of an area of about ten acres for lawn and ornamental grounds, and assisted in the planting. I also planned the planting of additional hedges. I examined the arboretum borders, orchard, and bush fruit plantations with the Superintendent, and explained the system of keeping records to the gardener, as at the other Farms. I again visited this Station on August 22-23, 1912, at which time I rendered what help I could in connection with the experimental work. I also planned a long perennial border to extend from near the Superintendent's house to the main gate.

On April 8 to 10, 1912, I was at Agassiz, B.C., and among other things planned the planting of a farmer's home fruit plantation of about three acres, to contain such kinds and varieties of fruits as it would be desirable for farmers to grow for home use. I later ordered the material for this plantation. I also planned a long perennial border and discussed with the Superintendent some changes which it seemed desirable to make in the ornamental grounds. I again visited Agassiz on August 6, 1912, and went over the experimental work in horticulture with the Superintendent.

On April 10 to 11, 1912, I visited the farm of Mr. Thos. A. Sharpe, at Salmon Arm, B.C., and examined the fruits in his orchard and other plantations and, on August 9, paid him another visit. Mr. Sharpe is testing a large number of varieties of apples, and, while the trees are yet young, the results should eventually be valuable.

PLACES VISITED.

On May 11, 1912, I left for England, having been appointed Canadian delegate to the Royal International Horticultural exhibition held in London on May 22 to 30. I reached London on May 22, and made my headquarters there throughout the period of the exhibition. The last previous International Horticultural exhibition held in England was in 1866. The exhibition of 1912 was the largest horticultural show ever held in any country, and I appreciated the opportunity of seeing it and of studying the many exhibits there. Many notes were taken which have already been put to good use. This exhibition also gave me the opportunity of meeting many horticulturists with a world-wide reputation. I visited the estates of Sir Trevor Lawrence, Burford Dorking; Sir Frank Crisp, Friar Park, Henley-on-Thames; Mr. Leopold de Rothschild, Gunnersbury Park, Acton, W.; Mr. H. J. Elwes, Colesborne, Cheltenham. At all of these beautiful places, I saw many things interesting and new to me. I also visited the South Eastern Agricultural College and Experimental Station at Wye, Kent; the Woburn Fruit Experimental Station, Ridgemont; the Royal Gardens, Kew; the Glasnevin Botanical Gardens, and the nursery of Amos Perry, Enfield, where much information was obtained.

While making my second journey to the western branch Farms in August, 1912, I visited orchards in the vicinity of Nelson, Grand Forks, and Trail, B.C. and got a very good idea of conditions in those parts of British Columbia. I also visited the Mitchell Nursery Co., at Coaldale and Lethbridge, Alta., and the Cloverdale Nurseries, near Edmonton, Alta.

On October 18, I left to attend the Dry Farming Congress at Lethbridge, Alta., and from there I went to British Columbia and made an examination of the stock of the Riverside nurseries, Grand Forks, and the Coldstream nurseries, Vernon; the Kelowna Land and Orchard Co's. nurseries, Kelowna; the Layritz nurseries, Kelowna;

the Royal nurseries, Vancouver; Brown Bros.' nurseries, Vancouver; and the Layritz nurseries, Victoria.

My assistant, Mr. T. G. Bunting, on August 12-17, 1912, inspected fields of vegetables in the competition organized by the Ontario Vegetable Growers' Association. On August 25-28 he judged the fruits and flowers at the Provincial exhibition, Quebec. On June 29 and August 29 he judged the gardens in a competition at Vankleek Hill, Ont., and between September 2 and 12 he attended the National exhibition, Toronto, and the Western fair, London, Ont.

My assistant in ornamental gardening, Mr. F. E. Buck, helped to judge the fruit and flowers at the Provincial exhibition, Quebec. He also attended the National exhibition, Toronto, and visited the Dale nurseries, Brampton, Ont., September 2-7, 1912, and the Ontario Fruit, Flower and Honey Show, Toronto, November 12-16, 1912.

My assistant in plant breeding, Mr. A. J. Logsdail, acted as judge at the Horticultural exhibition at Haileybury, Ont., on August 27-30, and at Vankleek Hill, Ont., September 19, 1912. He attended the Fruit, Flower and Honey Show and the meeting of the Ontario Fruit Growers' Association on November 13-18, 1912.

ADDRESSES.

I attended the meeting of the Ontario Fruit Growers' Association and the meeting of the Ontario Horticultural Association, on November 13 to 16, 1912, and gave an address at the former on 'The Best Varieties of Small Fruits,' and at the latter on 'Continuity of Bloom in Small Gardens.' I also compiled and read the annual report of the Committee on Novelties of the Ontario Horticultural Association. At this meeting, my assistant in ornamental gardening, Mr. F. E. Buck, read a paper on 'Everlasting Flowers.' On December 4 and 5, I attended a meeting of the Quebec Pomological Society at Macdonald College, Que., for which I prepared an obituary of the late Prof. John Craig. As president of the Society for Horticultural Science in 1912, I delivered the presidential address at the annual meeting at Cleveland, Ohio, on December 31, 1912, my subject being 'The Relation of Climate to Horticulture.' On February 3 and 4, 1913, I attended the Short Course in Horticulture at Macdonald College, Que., gave a talk on 'The Best Varieties of Fruits for the Province of Quebec,' and also an illustrated address on 'The Improvement of Home Surroundings.' At this short course, Mr Buck gave an address on 'Laying out Home Grounds.' On February 25 to March 1, I attended the meeting of the Niagara Peninsula Fruit Growers' Association, at Grimsby and St. Catharines, giving addresses on 'The Influence of Temperature on Fruit and Fruit Trees' and 'The Best Varieties of Apples and Plums for Market.' On March 18, Mr. Buck addressed the Smith's Falls Horticultural Society. Mr. T. C. Bunting, one of my assistants, gave a talk on 'Small Fruits for the City Garden' before the Ottawa Horticultural Society, July 23, 1912.

PUBLICATIONS.

During the year, I prepared pamphlets on 'Cabbage and Cauliflower Culture,' 'Tomato Culture,' and on 'Hardy Roses;' also, a 'Spraying Calendar,' all of which were published. In addition to these, several articles were written for horticultural publications. These included an article on 'Apple Culture in Canada,' 'Bush Fruits and Their Culture,' and 'Horticulture in Canada,' for the new edition of Bailey's Cyclopedia of American Horticulture. An article on 'Fruit Growing in Canada' was written for a book on 'Commercial Canada,' by F. Cook, and an article on 'The Christmas Tree,' for the December number of the *Canadian Horticulturist.*

The assistants in the Horticultural Division also prepared a number of articles for horticultural papers.

Donations During the Calendar Year 1912.

Sender.	Donation.
Adney, Tappan, Upper Woodstock, N.B.	Apple scions.
Adams, E. E., Leamington, Ont.	Seeds of selected Earliana tomato.
Arnold, Arboretum, Jamaica Plain, Mass., U.S.	Trees and shrubs.
Armstrong, C. G., Orono, Ont.	Potatoes, Aroostook Wonder.
Barclay, W. G., Nelson, B.C.	Wild strawberry, Anderson's variety.
Billings, Miss B., Brockville, Ont.	Scions of Billings' Red apple.
Courtneidge, W., Starbuck, Man.	Scions of Warren's No. 1 plum.
Davis, James, Maple Creek, Sask.	Squaw corn seed.
Elwes, H. J., Colesborne, Cheltenham, England	Herbaceous plants and one species of pine.
Fisher, A, L., Brockville, Ont.	Seeds of flowers and vegetables.
Havebrugs Experimental Station, Esbjerg, Denmark	Scions, Grev. A. W. Molkte pear, Skoofogerable and Elmelund apples.
Henderson & Co., New York, U.S.	Seeds of vegetables.
Hilborn, J. L., Leamington, Ont.	Seeds of selected Earliana tomato.
Hunt, A. S., Lawrencetown, N.S.	Scions of Schaffner's special apples.
Gilbert, G. S., Burton, N.B.	Scions of Fameuse Seedling, Greenish Seedling, Peabody Early apple and Yellow crab apple.
Johnson, H. D., Wolfville, Ont.	Scions of probably Fameuse apple seedling.
Keen, Alfred, St. Mary's Ferry, N.B.	Scions of Keen's Crimson apple.
Mitchell Nursery Co., Coaldale, Alta.	Seeds of white flowered delphinium.
Moore, Sir Frederick, Royal Botanic Gardens, Glasnevin, Ireland	Plants of herbaceous perennials.
Royal Botanic Gardens, Kew, England	Trees and shrubs.
Rowe, N. W., Wonwood, Tavistock, England	Scion of Pocket apple.
Revestadel Ministerio de Obras, Bogota, Republica de Colombia	Potatoes.
Sherrington, A. E., Walkerton, Ont.	Seeds of selected Early Detroit tomato.
Smith, Chas., Sandbeach, N.S.	Potatoes, No. 1, seedling.
Smith, W. H., Port Dover, Ont.	Scions of Red Seedling No. 3 apple.
Tribe, James, Inkster, Man.	Seeds of Tribe's Magnum Bonum pea.
Waters, A. A., Peel, Ont.	Orser beans.

STAFF OF THE HORTICULTURAL DIVISION.

W. T. Macoun, Dominion Horticulturist,

T. G. Bunting, B.S.A. (resigned November, 1912), Chief Assistant and Assistant in Pomology.

F. E. Buck, B.S.A., Assistant in Ornamental Gardening,

A. J. Logsdail, B.S.A., Assistant in Plant Breeding,

C. F. W. Dreher, B.S.A., Temporary Assistant in Vegetable Gardening,

J. F. Watson, Secretary,

H. Holz, Foreman,

Wm. Ellis, in charge of greenhouses,

H. J. Read, Assistant Foreman,

J. Taggart, Foreman of Ornamental Grounds.

ACKNOWLEDGMENTS.

My chief assistant and assistant in pomology, Mr. T. G. Bunting, continued to render valuable services until he left in November, 1912, to become Professor of Horticulture at the Macdonald College, Que. Mr. F. E. Buck, my assistant in ornamental gardening, has spent much time during the past year in the study of the plants under his charge, and has proven himself to be devoted to his work. Mr. A. J. Logsdail, who was temporarily employed in charge of the plant breeding during the latter part of the year, and permanently appointed at the close, did good work. Mr. Wm. Dreher, also temporarily employed during the latter part of the year, was able

to render me considerable assistance in the work with vegetables. The secretary of the Horticultural Division, Mr. J. F. Watson, who has now been connected with the Division for twenty years, and who has become very familiar with the details connected with the correspondence, orders, accounts, and other work which a secretary's office entails, has again efficiently discharged his duties. He is aided by Mr. M. D. MacCallum, who during the past year has satisfactorily written many of the letters in the general correspondence. Mr. H. Holz, who has been foreman of the Horticultural Division for fifteen years and associated with me as foreman for twenty years, has again looked after the outside work with diligence and thoroughness. Mr. Wm. T. Ellis has now been in charge of the greenhouses at the Central Experimental Farm for twenty-five years, and during the past year again rendered faithful service. Mr. Horace Read, assistant foreman, has satisfactorily assisted in the experimental work, as in previous years, by making many of the records, and has again devoted considerable time to the transferring of the horticultural records of the branch Farms to the central card system at Ottawa. Mr. James Taggart, as foreman of the ornamental grounds, continues to show much interest in his work, and in 1912 the grounds looked particularly well.

I again wish to express my appreciation of the faithful services of the other men employed in the Horticultural Division, who have most of the manual work to do.

My grateful acknowledgment is here recorded of the many kindnesses shown, and much assistance given me by the Superintendents of the branch Farms and Stations. By their ready co-operation in discussing suggestions made to them and in putting them into practice as far as was in their power, it has been possible for me to render considerable help in the development of the horticultural work under their immediate charge.

I have the honour to be, Sir,

Your obedient servant,

W. T. MACOUN,

Dominion Horticulturist.

CHARACTER OF SEASON.

Each year, for fourteen years, a record has been kept of the date when frost was out of the ground sufficiently to dig in certain parts of the horticultural grounds, the date in 1912 being April 10, and for the past fourteen years the average date is April 11.

April was a cool month. The highest temperature was on the 15th, when it was 67°F., and the lowest was on the 1st, when it was 7°F. The last spring frost was on April 30, when 32°F. was registered. Tree fruits and small fruits came through the winter well. The month of May was moderately warm to cool and showery. The highest temperature was 82°F. on the 28th, and the lowest 33°F. on the 14th. June was a moderately warm month with no hot days, and cool at nights. The early part of the month was showery and the latter part was dry. The highest temperature was 88·4°F. on the 24th, and the lowest 39·4°F. on the 7th. The only really hot spell during the growing season was from July 3 to July 10, which was very warm. The lowest maximum temperature of these days was 92·4°F., on the 4th, and the highest was 95·8° F. on the 7th, which was the hottest day of the year. It was 95°F. and over on the 6th, 7th, 8th and 9th. The warm weather continued

until the 15th, after which it was moderately warm to cool, and the remainder of the summer was unusually cool. The lowest temperature in July was 45·6°F. on the 31st. During August, the temperature was above 80°F. only three times, the warmest day being the 14th, when it was 81·5°F. The lowest temperature was 40·4°F. on the 30th. Showers were frequent in August. During September, the temperature reached 80°F. only once during the month, on the 7th. The first autumn frost was on the 30th, when the temperature dropped to 28·5°F., killing tender annuals, grape leaves, tomatoes, melons, squash, etc. September was a cool, showery month. October was fine but rather cool. The highest temperature was 75°F., on the 6th, the temperature rising above 70°F. only three times during the month. The lowest temperature was 26·2°F., on the 16th. Owing to the cool summer and autumn, the conditions were unfavourable for the ripening of melons and grapes, although a considerable quantity of these did mature.

Winter set in on November 25, in 1912, which is one day later than the average for the past fifteen years About 21 inches of snow fell, a very heavy fall for the first. There was little or no frost in the ground. The coldest day in November was the 28th, when it was 5·2°F., and the warmest was on the 6th, when it was 58·4°F. December was very mild for that month, the temperature being above freezing on 17 days, but the weather was very changeable. It was down to zero and below only four times during the month, the lowest temperature being -4·2°F., on the 21st. By the end of the month, there was only three or four inches of snow on the ground. January, 1913, was another very mild month, the temperature rising above freezing on 16 days and being below zero on only 4 days. The lowest temperature was -16·°F. on the 13th. The weather was very changeable during the month, with considerable rain. By the end of the month there were only about 3 inches of snow on the ground. February was the coldest month of the winter, although the lowest temperature, which was—18°F. on the 25th, was the highest minimum temperature in any winter of recent years, and there were no continuous spells of very cold weather. It was below zero on fifteen days of the month. The highest temperature was 37·8°F. on the 21st, but it was above freezing only three days. Owing to the many thaws during the month of January and the frosty weather which followed them, there was much ice during February, making conditions very unfavourable for herbaceous plants, particularly strawberries. There was no heavy snowfall in February and at the end of the month there were only about ten inches of snow on the level, with ice beneath. The weather continued cold until March 10, at which time there was about eighteen inches of snow, the most there had been since early in December.

Bush fruits, low-growing plants, and roots of trees did not have the usual protection during the winter. By March 21, the ground was bare in many places, and by the 24th the snow was practically all gone except in drifts, and later light snows remained but a short time.

While the winter, on the whole, was a mild one, the many changes of temperature must have been hard on plants. It is noted that most of the fruit buds of cherries and European plums are dead.

FRUIT AND VEGETABLE CROPS IN CANADA, 1912.

The apple crop in most fruit districts of Canada in 1912 was scarcely a medium one, but in British Columbia it was good. In Eastern Canada, the fruit was comparatively free of apple scab in the early part of the season, became badly affected in many places in the latter part of summer owing, doubtless, to the damp weather. This reduced the grade and the prices, which for the best fruit were relatively low but were still lower for these poorer grades. In eastern Ontario and the southwestern part of the province of Quebec, the ravages of the tent caterpillars lessened the crop

very much where the trees were not thoroughly sprayed, and left the trees in bad condition for developing fruit buds for 1913.

Pears were a good crop in the warmer parts of Nova Scotia, but in Ontario the crop was below medium. In the upper country of British Columbia it was good, but rather light on the lower mainland and on Vancouver island. The same notes will apply to the plum crop as to the pear, except that along the lower St. Lawrence, especially in L'Islet county, where it was good. A noted feature of the plum crop there was that the bulk of it was canned locally and sold co-operatively.

The peach crop in Ontario was a medium to good one, but the prices obtained were not as high as usual. In the Okanagan district of British Columbia, where most of the peaches of that province are grown, the crop was good, but the prices obtained were low.

The grape, which is one of the most reliable fruits, gave a good average crop in Ontario, where it is chiefly produced.

Owing to the cool season almost everywhere in Canada, the tenderer kinds of vegetables, such as tomatoes, melons, squash, etc., did not ripen as well as usual; but vegetables, the foliage, roots or tubers of which are used, did well.

The potato crop was a particularly good one nearly everywhere in Canada where it is grown, but unfortunately, as is often the case when the yield is large, the price obtained was small.

At the Central Experimental Farm, the crop of apples was medium to good, and very free from scab and codling moth.

There were a few European plums and a good crop of the American varieties. The cherry crop was almost a total failure, as usual; the flower buds are nearly always injured by winter.

The grape crop was below medium, and the fruit did not ripen as thoroughly as in some years.

The crop of currants, gooseberries, and raspberries was light to medium, and the crops of strawberries good.

The potato crop was very good; tomatoes below medium. and ripe melons light. Most of the other vegetables did well.

SEEDLING FRUITS RECEIVED FOR EXAMINATION, 1911-112.

There were not so many seedlings as usual received during the past year and, of those sent in, there were few that were promising. Following is a list of the names of persons from whom seedlings were received, with the numbers under which these were recorded. A description is published of two apples and a plum, these being of most interest. Apples: 583, crab apple from H. W. Roberts, Clarendon, N.B.; 584, from J. F. Cloutier, Ste. Eugène la France, P.Q.; 585, from R. J. Wiggins, Elmside, P.Q.; 586, from Duncan Bell, Ottawa, Ont.; 587, small apple from John Dearness, London, Ont. (see full description); 588 and 589, No. 1 and No. 2 from A. E. Wilson, Clarence, Ont.; 590 and 591, No. 1 and No. 2 from C. L. Stephens, Orillia, Ont.; 592, seedling of Longfield from Robt. Moore, M.D., Fort Frances, Ont.; 593, Wain apple from Mrs. C. L. Wain, Kamloops, B.C. (see full description), 594, from Mrs. S. W. Handy, Cascade, B.C. Plum: 595, from A. E. Guay, Ville Marie, P.Q.

APPLE SEEDLING FROM JOHN DEARNESS, LONDON, ONT.

Size below medium to small, largest specimen $2\frac{1}{4}$ by 2 inches, a smaller specimen, 2 by $1\frac{3}{4}$ inches; form, oblong or oval; cavity narrow, medium depth, russeted; stem long, slender; basin open, shallow, wrinkled; colour pale yellow, well washed and splashed with attractive carmine; dots moderately numerous, pale, indistinct;

flesh white, crisp, tender, juicy; skin moderately thick, tough; core medium size, seeds medium size, broad, acute; quality above medium. Season evidently mid to late September. An attractive-looking apple of striking shape. Tree found growing wild near Hawthorn, *Pyrus coronaria*, and Amelanchier, suggestive of Chenango Strawberry which might, perhaps, be a parent of it. Specimens sent by John Dearness, London, Ont., who found it on a botanizing trip. Should make an attractive ornamental plant.

APPLE SEEDLING FROM MRS. C. L. WAIN, KAMLOOPS, B.C.

Size large; form conical slightly ribbed, rather abruptly and tapering near basin; cavity medium depth and width, russeted; stem medium length, stout; basin deep, medium width, wrinkled; calyx open; colour yellow washed with pinkish red on sunny side; predominant colour yellow; seeds medium size, acuminate; dots numerous, grey, distinct; skin thick, moderately tender; flesh dull white or yellowish; core medium; flesh crisp, rather coarse, juicy; flavour mildly subacid, pleasant; quality above medium; season probably October and November; tree a seedling. General notes: an attractive-looking apple but not good enough in quality for dessert and not acid enough for cooking. May be useful if very hardy.

PLUM SEEDLING FROM A. E. GUAY, VILLE MARIE, P.Q.

Size large; form nearly globular, irregular; cavity medium size, moderately shallow; suture no depression, clearly lined; apex rounded, swollen opposite suture; colour yellow overspread largely by bright crimson red; predominant colour crimson red; dots indistinct; bloom none to very slight; skin moderately thin, toughish; flesh yellow, very juicy, somewhat soft; flavour, sweet, but lacking character; quality medium to above medium; stone roundish, much flattened, large, cling. General notes: A handsome plum, but sample too ripe to give justice; to all appearance, a first-rate fruit.

A WEALTHY APPLE ORCHARD—CLOSELY PLANTED.

In 1896, a small orchard of Wealthy apple trees was planted at the Central Experimental Farm, consisting of 144 trees, 10 by 10 feet apart, or at the rate of 435 trees per acre. The original area occupied by the trees was about one-third, $^{40}/_{121}$, of an acre, but this was reduced slightly in 1909, so that the area is now $^{340}/_{1089}$ of acre, still nearly one-third of an acre.

While the trees were planted ten by ten feet apart, since then some have died and others have been removed from time to time to give those which remained sufficient room to develop. Those removed have, as far as possible, been the poorer yielding specimens, a record having been kept of the yields of each tree since 1899. Of the original 144 trees, there are now ninety-seven left. Since the last report of this orchard was published, eleven trees have been removed. The trees are pruned moderately every year. The trees are too close to cultivate, but, as the ground is well shaded by them, the sod does not become thick. The grass is cut and allowed to lie in the orchard. The trees are manured once in about three years.

A record has been kept of the yields, sales, and expenses in connection with this orchard, which have been given in the annual reports for 1902, 1904, 1905, 1908 and 1910.

Following is a statement of yields, sales, expenses, and profits from the time the orchard was planted to the end of 1912:—

WEALTHY ORCHARD, 1896-1912

Net profit per acre, 1896-1904	$ 487 16
" 1905	103 13
" 1906	112 80
" 1907	37 54
" 1908	104 34
" 1909	108 98
" 1910	105 47
" 1911	49 38
" 1912	399 44
Total net profit per acre, 1896-1912 (17 years)	$1,508 24
Average net profit per acre from date of planting, 1896 to 1912	$ 88 72
Average net profit per acre from date of fruiting, 1899 to 1912	107 73

WEALTHY ORCHARD, 1910.

	Gallons.
Fruit picked	296
Windfalls	321¾
Total	617¾

Sales of Fruit.		Estimated per Acre
10 baskets at 45 cents	$ 4 50	$ 14 41
68 " 35 "	23 80	76 23
137 " 30 "	41 10	131 64
215 Total revenue, 1910	$ 69 40	$222 28

Expenses, 1910.		Estimated per Acre.
Pruning, 1 man 20 hours at 15 cents	$ 3 00	$ 9 61
Mowing, 1 man 10 hours at 15 cents	1 50	4 81
Material used for spraying	1 20	3 84
Spraying 4 times	3 00	9 61
Cost of 215 baskets and covers at 4 cents	8 60	27 55
Putting on tree protectors, 1 man 10 hours at 15 cents	1 50	4 81
Rent of land	0 94	3 00
Commission on sales	2 83	9 06
Picking fruit and gathering windfalls, 61 hours at 16⅔ cents	10 17	32 57
Packing fruit, 23 hours at 16⅔ cents	3 83	12 27
Total expenses, 1910	$ 36 57	$117 13
Net profits, 1910	32 83	105 15
	$ 69 40	$222 28

WEALTHY ORCHARD, 1911.

	Gallons.
Fruit picked	330½
Windfalls	129½
Total	460

Sales of Fruit.		Estimated per Acre
2 baskets at 25 cents	$ 0 50	$ 1 60
153 " 30 "	45 90	147 01
155 Total revenue, 1911	$ 46 40	$148 61

Expenses, 1911.		Estimated per Acre
Mowing, 1 man 10 hours at 16½ cents	$ 1 65	$ 5 28
Materials used for spraying	0 96	7 21
Spraying 3 times	2 25	3 08
Cost of 155 baskets at 4 cents	6 20	19 86
Putting on tree protectors, 1 man 10 hours at 16½ cents	1 65	5 29
Rent of land	0 94	3 00
Manure, 4 loads at 40 cents, teamster with team $4.	5 60	17 94
Picking fruit and gathering windfalls, 49 hours at 17½ cents	8 58	27 48
Packing fruit, 18 hours at 17½ cents	3 15	10 09
Total expenses, 1911	$ 30 98	$ 99 23
Net profit, 1911	15 42	49 38
	$ 46 40	$148 61

WEALTHY ORCHARD, 1912.

	Gallons.
Fruit picked	1,686
Windfalls	964
Total	2,650

Sales of Fruit.			Estimated per Acre.
100 baskets at 25 cents		$ 25 00	$ 80 07
309 " 30 "		92 70	296 91
145 " 27½ "		39 87½	127 72
199 " 32½ "		64 67½	207 15
101 " 35 "		35 35	113 23
854	Total revenue, 1912	$257 60	$825 08

Expenses, 1912.		Estimated per Acre.
Pruning, 1 man 30 hours at 19½ cents	$ 5 85	$ 18 74
Mowing, 1 man 8 hours at 18½ cents	1 48	4 74
Lime sulphur and poison, 1 spraying	1 45	4 64
Bordeaux mixture and poison, 3 sprays	1 04	3 33
Spraying, 4 times	3 13	10 03
Putting on tree protectors, 1 man 10 hours at 18½ cents	1 85	5 93
Rent of land	0 94	3 00
854 baskets and covers at 4 cents	34 16	109 41
Picking fruit and gathering windfalls, 172 hours at 19½ cents	33 54	107 43
Packing fruit, 145 hours at 19½ cents	28 28	90 58
Commission on sales of fruit	21 17	67 81
Total expenses, 1912	$132 89	$425 64
Net profits, 1912	124 71	399 44
	$257 60	$825 08

In the tables of revenue and expense given above, the estimates per acre are based on the sales actually made, assuming that the yields, prices, and cost of production would be in the same proportion per acre. It will be noticed that the proportion of windfalls is very high. Those acquainted with the Wealthy apple will know that this variety is very subject to dropping. Some of the windfalls were sold. The fruit was all sold on the local markets.

The rent of the land is low for orchard land, but fruit is not one of the main crops of the Ottawa district ,and the rent is estimated on farm land.

While it is of interest to record the returns from a closely-planted Wealthy orchard, and while the returns at the Central Experimental Farm have averaged well since the trees began to fruit, close-planting is not recommended to the average farmer, as, if some of the trees are not removed in good time, the others will suffer. In any case, only early-bearing varieties, such as Wealthy and Wagener, should be treated in this way. Twelve feet apart each way would have been a better distance than ten feet. Another method of planting suggested for the best apple districts, is to have the permanent trees thirty-six to forty feet apart each way, with early-bearing varieties between, and thus have the trees at first eighteen by thirty-six feet apart, having in view the cutting out of the early-bearing trees in from fifteen to twenty years. An additional row of trees of an early-bearing variety might be planted between the permanent rows, unless the space is utilized for vegetables or small fruits. A row of this kind, however, interferes with spraying before many years. When early-bearing varieties are planted closely in solid blocks spraying may be done with a long hose and a row is left out for a driveway about every 100 feet.

APPLES ORIGINATED IN THE HORTICULTURAL DIVISION, CENTRAL EXPERIMENTAL FARM.

SEEDLING VARIETIES.

Since 1903, there have been 1,148 apple trees which have fruited among those which have been raised from seed in the Horticultural Division without hand pollination, and of which only one parent is definitely known. Of these varieties one hundred and fifty-two fruited for the first time in 1912. Of the total of eleven hundred and forty-eight varieties which have fruited, eighty-one have been considered sufficiently promising to name and, of these, the descriptions of fourteen are now published all, but one, for the first time.

Ascot (Northern Spy seedling).—Fruit medium to large; form roundish; cavity medium depth and width, russeted at base; stem medium length, slender to moderately stout; basin deep, medium width, smooth; calyx closed or open; colour yellow well washed with crimson; predominant colour crimson; seeds medium size, acute; dots obscure; skin moderately thick, moderately tough; flavour subacid, pleasant but not high; core medium, open; flesh yellowish with traces of red, crisp, tender, juicy; quality good; season late November probably to February or later. *General notes*: Resembles Northern Spy a little in outward appearance and considerably in flesh and flavour.

Brisco (Langford Beauty seedling).—Fruit medium size; form roundish; cavity medium depth and width; stem medium to long, slender; basin deep, medium width, slightly wrinkled; calyx closed or partly open; colour greenish yellow washed with deep attractive crimson; predominant colour deep crimson; seeds medium size, acute; dots few, yellow, distinct; skin moderately thick, moderately tender; flesh yellowish, crisp, juicy; core above medium, open; flavour briskly subacid, pleasant, spicy; quality good; season late September to middle November. *General notes*: Resembles Langford Beauty somewhat in outward appearance, also resembles Jonathan a good deal in appearance and flavour.

Diana (Langford Beauty seedling).—Fruit medium size; form roundish; cavity medium depth and width; stem medium length, moderately stout; basin open, deep, wrinkled; calyx closed; colour yellow well washed with attractive crimson; predom-

inant colour attractive crimson; seeds medium size, acuminate; dots few, white, indistinct; bloom thin, pinkish; skin moderately thick, moderately tender; flesh white with traces of red, crisp, tender, juicy; core medium size, open; flavour briskly subacid, aromatic; equally good; season October and November probably. *General notes*: Resembles Langford Beauty somewhat in colour and character of flesh. A handsome apple.

Epsom (Northern Spy seedling).—Fruit above medium to large; form roundish, conical; cavity medium depth and width, russeted; stem medium length, stout; basin deep, open, wrinkled; calyx open; colour pale yellow well washed and splashed with crimson; predominant colour crimson; seeds medium size, acute; dots few, small, white, distinct; bloom bluish; skin thick, moderately tough; flesh yellowish, tender moderately juicy; core above medium, open; flavour subacid, pleasant; quality good; season October to middle November. Much like Spy in shape, colour, flesh and flavour. Promising.

Galena (Langford Beauty seedling).—Fruit medium to above medium in size; form roundish; cavity medium depth and width; stem short to medium, moderately stout; basin deep, medium width, slightly wrinkled; calyx closed or partly open; colour pale greenish yellow well washed with deep crimson, predominant colour deep crimson; seeds medium size, acute; dots very few, yellow, distinct; skin moderately thick, tender; flesh white, with traces of red, tender, juicy; core medium size, open; flavour subacid, pleasant; quality good; season, October to late December. *General Notes*: Resembles Langford Beauty considerably in outward appearance and in flesh and flavour, also resembles McIntosh considerably in outward appearance.

Grover (McIntosh seedling).—Fruit medium size; form oblate, slightly ribbed; cavity medium depth, open; stem short, stout; basin medium depth and width, slightly wrinkled; calyx partly open; colour pale yellow well washed with deep crimson; predominant colour deep crimson; seeds large, broad, acute; dots few, white, distinct; bloom slight, bluish; skin moderately thick, tough; flesh white tinged with red, tender, juicy; core medium; flavour subacid, sprightly, pleasant, spicy; quality good; season December probably to middle winter or later. Probably later in season than McIntosh. Resembles McIntosh considerably in colour and in flesh, also somewhat about cavity. Promising.

Humber (Golden Russet seedling).—Fruit above medium in size; form oblate to roundish, flattened at ends; cavity open, medium depth, russeted; stem short, stout; basin open, deep, wrinkled; calyx open; colour yellow, washed with orange red, mostly on sunny side; seeds large, obtuse; dots moderately numerous, yellow, distinct; skin moderately thick, moderately tender; flesh dull white or yellowish, firm, rather coarse, moderately juicy; core small; flavour subacid, pleasant, spicy; quality, good; season January to late winter or spring. Resembles Golden Russet somewhat in flesh and flavour.

Manda (Salome seedling).—Fruit above medium size; form roundish; cavity open, medium depth; stem medium length, stout; basin medium depth and width, smooth; calyx open; colour, yellow washed, splashed and striped with carmine; predominant colour carmine; seeds below medium, acute; dots obscure; skin moderately thick, tender; flavour subacid, pleasant; core medium size; flesh dull white, crisp, tender moderately juicy; quality good; season November to February.

Moreno (Langford Beauty seedling).—Fruit medium to above; form oblate, conic; cavity narrow, medium depth; stem medium to long, moderately stout; basin

open. medium depth, wrinkled; calyx open or closed; colour pale yellow washed and splashed with carmine; predominant colour carmine; seeds medium size, broad, acute, dots obscure; skin thin, tender; flesh white, crisp and tender, juicy; core medium; flavour subacid, sprightly, pleasant; quality good; season October to mid-December.

Niobe (Northern Spy seedling).—Fruit above medium; form roundish, regular or slightly ribbed, conical; cavity deep, medium width; stem medium to long, slender to moderately stout; basin deep, medium width, smooth to slightly wrinkled; calyx partly open; colour greenish yellow washed and splashed with rather dull crimson; predominant colour rather dull crimson; seeds above medium; dots few, white, indistinct; bloom thin, pinkish; skin moderately thick, tough; flesh yellowish, crisp tender, rather coarse, moderately juicy; core medium, open; flavour mildly subacid, pleasant; quality good to very good; season December to late winter. Described in 1912, also.

Orlando (Northern Spy seedling).—Fruit medium size; form roundish, conical, ribbed; cavity deep, medium width, russeted; stem medium length, slender to moderately stout; basin narrow, deep, slightly wrinkled; calyx partly open or closed; colour yellow washed with bright crimson; predominant colour bright crimson; seeds medium size, acute; dots few, white, indistinct; skin moderately thick, moderately tender; flesh yellow with traces of red, tender, juicy, crisp; core medium, open; flavour briskly subacid, sprightly, aromatic; quality good; season late September to December.

Pandora (Northern Spy seedling).—Fruit above medium; form roundish, slightly ribbed; cavity deep, open; stem short, stout; basin deep, open, nearly smooth; calyx partly open; colour yellow washed and splashed with light crimson; predominant colour light crimson; seeds medium size, acute; dots few, white, indistinct; skin moderately thick, tender; flesh dull white, crisp, tender, juicy; core medium size, open; flavour subacid, pleasant, not high; quality above medium to good; season November and December.

Pedro (McIntosh seedling).—Fruit above medium; form oblate to roundish, conic; cavity deep, medium width, russeted; stem short to medium, stout; basin narrow, medium depth, smooth; calyx open; colour pale yellow well washed with bright attractive crimson; predominant colour bright crimson; seeds medium, acute; dots obscure; skin moderately thick, tender; flesh dull white, tender, juicy; core medium size, open; flavour briskly subacid, pleasant; quality good; season November to January.

Ramona (Shiawassee Beauty seedling).—Fruit medium to above medium; form oblate; cavity deep, open, slightly russeted; stem short, stout; basin open, medium depth, wrinkled; calyx closed; colour pale yellow washed and splashed with carmine on sunny side; dots obscure; skin moderately thick, tender; flesh white, fine grained, tender, juicy; core medium to small; flavour subacid, pleasant; quality good; season late August to mid-September.

CROSS-BRED VARIETIES.

While the larger proportion of trees raised from seed have not been the result of hand pollination, cross-breeding has not been neglected, and there are now 701 trees growing as the result of such work. Of these twelve fruited in 1912 and two of them were considered sufficiently promising to name, and descriptions of them follow.

Rustler (McIntosh x Lawver).—Fruit above medium; form roundish, slightly ribbed; cavity open, medium depth; stem medium length, stout; basin deep, medium

width, smooth; calyx open; colour yellow, almost or quite covered with crimson; predominant colour crimson; seeds medium size, acute; dots numerous, yellow, distinct; bloom bluish; skin thick, tough; flesh yellowish with traces of red, moderately juicy, firm but tender; core medium size; flavour subacid, pleasant; quality above medium to good; season, December probably to March or later.

Vermac (Lawver x McIntosh).—Fruit below medium, almost small; form roundish; cavity medium, depth and width; stem medium length, moderately stout; basin shallow, medium width, wrinkled; calyx closed or partly open; colour yellow almost entirely covered with rich deep attractive crimson; dots small, indistinct; bloom traces, bluish; skin thick, tough; flesh white tinged with red and a bright red core line, tender, juicy; core above medium to large, open; flavour subacid, pleasant, good, with aroma of McIntosh; quality good; season probably early to mid-winter, decidedly later than McIntosh.

CROSS-BRED VARIETIES ORIGINATED BY DR. WM. SAUNDERS.

A large number of cross-bred varieties were originated outside the Horticultural Division at the Central Experimental Farm by Dr. Wm. Saunders, late Director, an account of which work was published by him in Bulletin 68 called 'Progress in the Breeding of Hardy Apples for the Canadian Northwest.' These crosses are now under the charge of the Dominion Horticulturist, and following are descriptions of the best of the second crosses which fruited in 1912, being the F_1 generation from crosses between varieties of the F_1 generation of the first cross and named varieties of larger apples. 'Dean,' for instance is *P. baccata* x Wealthy, and 'Angus' is Dean x Ontario. The best of the first crosses which were crosses between the wild Siberian crab apple *Pyrus baccata* and varieties of apples, gave fruit little larger than the best named crab apples, while the second crosses, which have a larger quota of apple blood, have given fruit 2½ inches in diameter, and, if they are sufficiently hardy, will prove very valuable.

Angus (Dean x Ontario).—Fruit below medium to medium in size, 2 by 2½ inches; form roundish, slightly ribbed; cavity narrow, medium depth; stem long, slender; basin open, medium depth, wrinkled; calyx partly open; colour yellow washed with pinkish red; predominant colour pinkish red; seeds medium size for an apple, acute; dots few, small, white, distinct; skin thin, tender; flesh, yellow, crisp, breaking, moderately juicy, core medium; flavour, briskly subacid; quality above medium; season October to middle November. *General Notes*: No marked resemblance to Ontario. Of good size. Flesh, skin and stem, crab-like; seeds apple-like.

Elkhorn (Jewel x Gideon).—Fruit large for a crab, small as an apple, 1¾ by 2¼ inches; form oblate to roundish; cavity open, medium depth; stem long, slender; basin open, wrinkled; calyx closed; colour yellow, well washed with crimson; predominant colour crimson; seeds small for an apple, acute; dots obscure; skin thin, tender; flesh yellowish, crisp, breaking, juicy; core above medium; flavour acid, pleasant; quality above medium; season late September and October. *General Notes*: This should make a good late crab apple for any part of Canada. No resemblance to Gideon. All marked characters are crab-like.

Gretna (Pioneer x Northern Spy).—Fruit large for a crab, small for an apple, 2 by 2¼ inches; form oblate; cavity deep, open; stem medium to long, stout to moderately stout; basin open, medium depth, wrinkled; calyx open; colour yellow, washed and splashed with crimson; predominant colour crimson; seed below medium for an

apple, large for a crab, acute; dots few, white, distinct; skin moderately thick, tender; flesh yellowish, crisp, breaking, juicy; core medium; flavour briskly subacid, pleasant, sprightly; quality good; season November to January. *General Notes*: Resembles Northern Spy considerably in colour, flesh and flavour. Promising.

Martin (Pioneer x Ontario).—Fruit below medium 2¼ by 2⅜ inches; form roundish; cavity narrow, medium depth, russeted; stem medium length, slender; basin medium depth and width to shallow almost smooth; calyx open; colour pale yellow washed with pinkish red; predominant colour pinkish red; seeds medium for an apple, acuminate; dots obscure; skin moderately thick, tender; flesh yellow, crisp, tender, juicy; core medium size, open; flavour subacid, pleasant; quality good; season October to mid-December.

Ruth (*Pyrus prunifolia* x Pewaukee).—Fruit small for an apple, but as large as Martha crab apple, 1⅝ by 1⅞ inches to 1⅞ by 1⅞ inches; form roundish conical; cavity open, medium depth; stem long, slender; basin deep, medium width, wrinkled; calyx open; colour yellow well covered with deep crimson; predominant colour deep crimson; dots moderately numerous, white, distinct; skin, thin, tender; flesh yellow, stained with red, tender juicy; core above medium; flavour subacid, pleasant, no astringency; quality good; season October to November.

Trail (Northern Queen x Rideau).—Fruit large for a crab, a little larger than Martha; form oblate, almost roundish; cavity medium depth and width; stem very long, slender; basin open, deep nearly smooth; calyx closed; colour pale yellow splashed and washed with orange red and crimson; predominant colour orange red; seeds below medium, acute; dots few, indistinct; bloom slight, pinkish, firm; skin thin, tender; flesh yellowish, crisp breaking; core medium; flavour subacid, sprightly, very pleasant; quality good to very good; season late August.

Wapella (Dean x Ontario).—Fruit below medium for an apple, very large for a crab 2¼ by 2¼ inches; form roundish to oblong, ribbed; cavity medium depth and width; stem medium length, slender to moderately stout; basin open, deep, wrinkled; calyx partly open, or closed; colour yellow washed with red; predominant colour red; seeds medium size for an apple, obtuse; dots very few, indistinct; bloom pinkish, thin; skin moderately thick, moderately tender; flavour briskly subacid, pleasant; core medium; flesh yellowish with traces of red, crisp, breaking, juicy; quality above medium; season late December, probably to March or April.

PLUM SEEDLINGS.

The successful culture of the European or *domestica* plums is confined mainly to the warmest parts of Canada or where the winters are tempered by large bodies of water. The two native American species, *Prunus nigra* and *Prunus americana*, on the other hand, can be grown successfully where the winters are very severe. Many good varieties of these have been introduced and further improvement is being made. What is needed are early varieties of good quality for those parts where the growing season is short, and varieties with thinner skins for all parts. They should also, if possible, have good shipping qualities. At the Central Experimental Farm, a considerable number of good seedlings have been originated and some of the best have been named. The following five varieties were named in 1912. Four of these are seedlings of other Experimental Farm seedlings and are thought to be better than the parents. None of these is early enough for the prairie provinces, where only the earliest should be tried.

Corona (Caro seedling).—Large; oval; lopsided; cavity medium size, shallow; suture slightly depressed, lopsided; apex knobbed, irregular; greenish-yellow overspread with bright red; predominant colour red; dots indistinct; bloom moderate; skin thick, tough, slightly bitter, flesh yellow to greenish-yellow, firm, juicy meaty; sweet,

sprightly flavour; quality good; stone large, flattened, cling. Season late September. A very promising plum, large, of attractive appearance, of firm texture. Should prove to be a good shipper.

Firmana (Consul seedling).—Large; oval, wedge, slightly lopsided; cavity medium to large, medium depth; suture indistinct; apex flattened; yellow, mottled and washed with carmine-red; predominant colour carmine-red; dots few, medium size, around apex; bloom moderate; skin medium thick; flesh yellow, firm, somewhat dry; sweet to insipid flavour; quality medium; stone large, bean shaped, flattened, free; season late September. A plum possessing pre-eminently the characteristics of a good shipping fruit. Ten fruits weighed 10 ounces.

Hazel (Gloria seedling).—Large; rounded ovate; cavity shallow, medium; suture indistinct, fairly clearly lined; apex rounded; yellow, generally entirely overspread with a dull, rich red; predominant colour dull, rich red; dots, medium to large, distinct, yellow, bloom moderate; skin thick, tough, but agreeable; flesh golden yellow, juicy, moderately firm; sweet flavour; good quality; stone large, elongated ovate, flattened. Season mid-September. A very attractive plum of considerable promise.

Rhoda (Cheney seedling).—Large; oval (regular); cavity broad, moderately deep to shallow; suture slightly depressed, faintly lined; apex rounded; dark red; predominant colour dark red; dots small, numerous, indistinct; bloom none to slight; skin fairly thin, tough, peels when ripe; flesh rich orange-yellow, firm, juicy; sweet, rich, pleasant flavour; good quality; stone broadly oval, dark colour, semi-free. Season mid-September. A good plum.

Vesta (Gloria seedling).—Large to very large, oval; cavity medium to large, shallow; suture slightly depressed, fairly clearly lined; apex swollen, opposite suture; yellow overspread by bright pink to dark carmine-red; predominant colour light carmine-red; dots medium to large, distinct, yellowish; bloom moderate; skin thick, slightly bitter; flesh yellow, juicy, firm, meaty, sweet, distinctive flavour; good quality; stone large, flattened, oval, nearly free. Season late September. One of the best. Ten fruits weighed 12 ounces. Attractive, large, firm, of good quality; skin somewhat tough.

SEEDLING STRAWBERRIES.

While seedling strawberries have not been grown on a very large scale at the Central Experimental Farm, a limited number of plants have been raised from seed, though none of these was hand pollinated. Of 650 seedlings which fruited in 1889, forty were saved at first and these were gradually reduced in numbers, but none was thought worthy of introduction. In 1897, about 1,400 seedlings were raised from some of the best named varieties. These were gradually reduced to thirty-four, among which were some of great promise. In the winter of 1905-6, these were practically all winter-killed, so that nothing came of this experiment. In 1906, seed was sown of Bubach, Wm. Belt, and Marshall, and while the number of these which fruited was small, there being only ninety seedlings of Bubach, seventy-three of Wm. Belt and seven of Marshall, the proportion of very promising varieties has been large. None of the Marshall seedlings, though good in quality, were productive, but so promising were the others that in 1912, there were still being grown thirty-seven Bubach seedlings and twenty-four Wm. Belt seedlings. Both Bubach and Wm. Belt would appear to be excellent mothers to use in breeding strawberries.

Twenty-one of the best of these sixty-one seedlings have been named as follows: Bianca, Cassandra, Celia, Cordelia, Desdemona, Francesca, Helena, Hermia, Julia, Lavinia, Lucetta, Mariana, Miranda, Octavia, Olivia, Ophelia, Portia, Silvia, Valeria, Viola, Virgilia, these being names of Shakespeare's heroines. It is proposed to send these out to the branch Experimental Farms and other places for further test. Following are descriptions of thirteen of these varieties:—

Cassandra (Bubach seedling), Imp.—Form roundish, wedge-shaped, regular; size large; external colour bright scarlet, glossy; colour of flesh deep salmon; core tender; texture juicy; flavour briskly subacid, pleasant; quality above medium to good; season medium to late; shipping quality moderately firm; plant vigorous; foliage good; a handsome variety of good size, form and colour. Productive.

Cordelia (Bubach seedling), Per.—Form roundish, wedge-shaped; size large; external colour bright red, glossy; colour of flesh deep salmon; seeds medium; core tender; texture juicy; flavour briskly subacid, pleasant; quality above medium to good; season medium to medium late; shipping quality, moderately firm; plant vigorous; foliage good; attractive in appearance of good size, and productive. Should make a good commercial berry.

Desdemona (Bubach seedling), Imp.—Form wedge-shaped; size medium to large; external colour dark red; colour of flesh dark red; seeds medium; core solid but tender; texture juicy; flavour briskly subacid, pleasant; quality above medium to good; season medium to late; shipping quality moderately firm to firm; plant vigorous, productive; foliage good; a good berry for home use.

Hermia (Wm. Belt seedling), Per.—Form conical to wedge conical; size medium to large; external colour bright deep red, glossy; colour of flesh deep red; seeds medium; core tender; texture juicy; flavour subacid, good; quality good; season medium; shipping quality firm; plant vigorous, productive; foliage good. A good berry, attractive in appearance.

Julia (Bubach seedling), Imp.—Form conical to somewhat wedge-shaped, fairly regular; size large; external colour bright to deep red, glossy; colour of flesh deep salmon; seeds medium; core tender; texture juicy; flavour briskly subacid, pleasant; quality above medium to good; season medium; shipping quality firm; plant vigorous, productive; foliage good. Ripens evenly to tip. Attractive in appearance. Should make a good market berry.

Lucetta (Bubach seedling), Per.—Form blunt, wedge-shaped; size large; external colour deep scarlet; colour of flesh red; seeds medium; core tender; texture juicy; flavour subacid; quality medium; season medium early; shipping quality moderately firm to firm; plant vigorous, moderately productive; foliage good. Attractive in appearance. Should ship well.

Mariana (Bubach seedling), Per.—Form wedge-shaped to roundish wedge-shaped; size large; external colour bright, deep scarlet, glossy; colour of flesh deep salmon; seeds medium; core tender; texture juicy; flavour subacid, pleasant; quality above medium to good; season medium to medium late; shipping quality moderately firm; plant vigorous, productive; foliage good; of good size and attractive appearance. Good for home market.

Miranda (Bubach seedling), Per.—Form roundish to wedge-shaped, somewhat irregular; size large; external colour bright deep red, glossy; colour of flesh red; seeds depressed; core tender; texture juicy; flavour briskly subacid; quality above medium to good; season medium early; shipping quality firm; plant vigorous, productive; foliage good. A large firm berry which should be desirable for market.

Ophelia (Wm. Belt seedling) Per.—Form long wedge-shaped, somewhat necked; size large; external colour bright scarlet, glossy; colour of flesh pale red; seeds medium; core tender; texture juicy; flavour briskly subacid; quality good; season medium late; shipping quality firm; plant vigorous, productive; foliage healthy. A large berry of good quality.

Portia (Wm Belt seedling), Imp.—Form roundish conical to wedge conical; size large; external colour deep red, glossy; colour of flesh deep rich red; seeds very prominent; core tender; texture juicy; flavour briskly subacid, pleasant; quality good; season medium late to late; shipping quality firm; plant vigorous; foliage good. A late berry of good form and colour.

Silvia (Wm. Belt seedling).—Form roundish to wedge-shaped, blunt and flat at apex; size large; external colour deep red; colour of flesh deep salmon; seeds medium; core tender; flavour briskly subacid, pleasant; quality above medium to good; season medium late; shipping quality moderately firm; plant vigorous productive; foliage good. An attractive looking variety. Fruit ripens evenly and retains good size through the season.

Viola (Wm. Belt seedling), Imp.—Form conical to somewhat wedge-shaped; size large; external colour bright to dark red; colour of flesh deep rich red; seeds large, prominent; core tender; texture juicy; flavour briskly subacid, pleasant; quality good; season medium late, shipping quality firm; plant strong grower; foliage good. A large-fruited variety. Should make a good shipper.

Virgilia (Wm. Belt seedling), Imp.—Form roundish to wedge-shaped; size large; external colour deep red; colour of flesh deep red; seeds medium; core tender; flavour subacid, pleasant; quality above medium to good; season medium; shipping quality moderately firm to firm; plant vigorous, productive; foliage good. An attractive looking berry, being of good size, colour and form.

VEGETABLES.

FARMERS' LIST OF BEST VEGETABLES.

The 'Farmers' List of Best Vegetables' which has been published from time to time in the annual report has been much appreciated. This list is really a summary of the variety tests, and gives, in a comparatively small space, the names of those vegetables which are considered the best. The following list has been revised up to the autumn of 1912:—

Asparagus.—Palmetto is proving a better variety than Conover's Colossal for general planting, as it is not so subject to the disease known as Asparagus Rust. Argenteuil is also a good variety.

Beans.—Round Pod Kidney Wax and Wardwell's Kidney Wax are two of the best yellow-podded or wax bush beans, and are both early. Stringless Green Pod, Early Red Valentine and Early Refugee are three good, green-podded varieties. Refugee or Thousand to One is one of the best later sorts. Among Lima beans, the dwarf or bush forms are the most satisfactory.

Beets.—Meteor, Early Model, Electric, Egyptian and Eclipse are some of the best.

Borecole or Kale.—Dwarf Green Curled Scotch.

Brocoli.—White Cape.

Brussels Sprouts.—Improved Dwarf. The dwarf varieties have been found more satisfactory than the tall-growing ones.

Cabbage.—Early Jersey Wakefield, Copenhagen Market (early), Succession (medium), Danish Ballhead and Drumhead Savoy (late), Red Dutch (red) is a good

list. Houser has been found freer from disease than most. For extra early use, Paris Market is desirable, being nearly a week earlier than Early Jersey Wakefield.

Cauliflower.—Early Dwarf Erfurt and Early Snowball.

Carrots.—Chantenay is one of the best, but if a good extra early sort is required, the Early Scarlet Horn can be planted with advantage. It is a small variety.

Celery.—Golden Self-Blanching (Paris Golden Yellow) (early), French Success, Noll's Magnificent, Perfection Heartwell, Triumph, Winter Queen are all good late varieties. London Red is a good red one. White Plume is desirable for the prairies.

Corn.—Malakoff, Peep O'Day (extra early), Early Fordhook, Early Cory (early), Crosby's Early, Golden Bantam, Metropolitan (second early), Perry's Hybrid, Early Evergreen and Black Mexican (medium) Stowell's Evergreen, Country Gentleman (late). In planting, the Country Gentleman should not be omitted, as it lengthens the season very considerably and is of fine quality. Golden Bantam is the best second early for home use. It is of excellent quality.

For the prairie provinces and other parts of Canada where the nights are cool, Squaw and Extra Early Adams, though not sweet varieties, develop better than others.

Cucumbers.—Peerless White Spine or White Spine, Davis Perfect, Cool and Crisp, and Giant Pera are some of the most satisfactory. Boston Pickling and Chicago Pickling are good pickling sorts.

Egg Plant.—New York Improved and Long Double Purple succeed best.

Lettuce.—Grand Rapids, Black-seeded Simpson (early curled), Iceberg, New York, Giant Crystal Head, Crisp as Ice, and Improved Hanson (curled cabbage), Improved Salamander (uncurled cabbage). Grand Rapids is the best variety for forcing. Iceberg remains headed longest in summer. Trianon and Paris are two of the best Cos varieties.

Melons, Musk.—Long Island Beauty and Hackensack are two of the earliest and best of the Nutmeg type Montreal Market is later, but of larger size and finer flavour. Emerald Gem and Paul Rose are two of the best yellow-fleshed melons.

Melons, Water.—Cole's Early, Salzer's Earliest, Ice Cream, Phinney's Early are some of the most reliable.

Onions.—Yellow Globe Danvers and Large Red Wethersfield are two of the best and most reliable. Australian Brown is also good. Prize Taker is a good variety for transplanting.

Parsley.—Double Curled is as good as any.

Peppers.—Cayenne, Chili, Cardinal. The Early Neapolitan is one of the earliest of the large peppers.

Peas.—Gregory's Surprise (extra early), Thos. Laxton, Gradus, American Wonder, Nott's Excelsior, Sutton's Early Giant (early), Sutton's Excelsior, Premium Gem (second early), McLean's Advancer, Heroine and Stratagem (medium to late). The foregoing varieties, not being tall growers, may be grown without supports. Quite Content, Telephone and Champion of England are three of the best tall-growing sorts.

Potatoes.—Early: Rochester Rose, Early Ohio (pink), Irish Cobbler, Eureka Extra Early, Early Petoskey, New Early Standard (white), Bovee (pink and white). Main crop: Carman No. 1, Gold Coin, Factor, Dalmeny Beauty, Money Maker (white).

Radishes.—Early: Scarlet White-tipped Turnip, Rosy Gem, French Breakfast, Red Rocket (red), Icicle (white). Late: White Strasburg, Long White Vienna. Winter: Long Black Spanish, Chinese Rose-coloured, New White Chinese or Celestial.

Rhubarb.—Linnaeus, Victoria.

Salsify.—Long White, Sandwich Islands.

Spinach.—Victoria, Thickleaved.

Squash.—White Bush Scalloped, Long White Bush, Summer Crook Neck. Late: Delicious, Hubbard.

Tomatoes.—Early: Sparks' Earliana, Chalk's Early Jewel, Bonny Best, Dominion Day (scarlet). Medium: Matchless, Trophy (scarlet), Livingston's Globe, Plentiful (purplish pink).

Turnips.—Early: Extra Early Milan, Red Top Strap Leaf.

Swedes.—Champion Purple Top, Skirving's Improved.

TOMATOES UNDER GLASS.

In the annual report for 1912, the results of a variety test of tomatoes in a small greenhouse at the Central Experimental Farm were recorded. During the past year, eighteen varieties and strains were again tested in the same house. This house is used for ornamental plants as well, and only part of the space was available for the tomato plants. The plants were set fifteen inches apart in a single row on the benches on each side of a central walk, sufficiently far back so that a row of begonias could be grown in front of them. As they grew, the plants were tied to wires and kept pruned to single stems. Four plants of each variety were used, two plants of each variety being on each side of the walk opposite each other. The seed was sown on June 12, 1912, germinated on June 18, the young plants were pricked out in a cold frame on June 24 and planted in the greenhouse on July 24. The plants made rapid growth and the first ripe fruit was picked on September 16 from Sparks Earliana No. 10 strain. Early in the season, the plants produced large clusters of flowers, the fruit set well and there were prospects of a good crop, but, during the months of August and September, there was much rain and dull weather, there being 99·9 hours less sunshine than the average during August, and 108·0 hours less than the average during September. As a result there was a poor setting of fruit during September. By the end of that month, the plants had reached the top of the house and, as there was practically no fruit on them except near the bottom, it was decided, as an experiment, to head them back to within three feet of the soil. This was done on September 28. Most of the plants, though checked severely, recovered from the effects of the heading-back and made medium growth again. On the new growth some moderately good fruit set, but the results obtained from such severe checking of the plants were not such as to warrant recommending it, as the different varieties did not recover equally well from the heading-back. The yields obtained in 1912-13 are not reliable, but, as indicating the varieties which are likely to give the largest yields in an unfavourable season, and under such treatment, the following record is given of the six most productive sorts, the varieties tested being Winter Beauty, Industry O.A.C. Selected 1910, Industry O.A.C. Selected 1910-11, Improved Express, Sutton's Satisfaction, Sparks Earliana No. 10, Bonny Best, Sparks Earliana (C.E.F 2/12) Chalk's Early Jewel, Dobbie's Champion, Dominion Day, Wealthy, Sutton's A1, XXX Earliest Scarlet, Cox's Earliest, Greater Baltimore, Livingston's Globe.

TOMATOES.—TEST OF VARIETIES.

Name.	Number of Plants.	Date of First Picking.	Date of Last Picking.	Number of Pickings.	Largest yield from single plant at one picking.	Date of largest yield from single plant at one picking.	Total yield of ripe fruit.		Average yield per plant of ripe fruit.		Remarks.
		1912.	1913.		oz.	1912.	lb.	oz.	lb.	oz.	
Winter Beauty	4	Oct. 8	Feb. 10	9	22½	Nov. 15	16	15½	4	3¾	Roundish, smooth, slightly under medium size; flesh soft, watery, and slightly acid, of rather poor quality. Scarlet.
Industry (O.A.C. selected 1910)	4	" 2	Jan. 25	11	22	Oct. 8	16	11½	4	2¾	Oval, smooth and uniform; flesh above medium in size, firm, juicy, acid. Good quality. Scarlet. One of the best varieties.
Improved Express	4	Sept. 26	" 29	9	16	" 24	16	5½	4	1¼	Roundish, smooth, uniform, large; flesh firm, juicy, slightly acid. Scarlet.
Sutton's Satisfaction	4	Oct. 8	Feb. 10	10	23¾	" 21	15	15½	3	15¾	Roundish, smooth, uniform in size and colour; flesh firm, juicy, sweet. Deep scarlet. A good variety.
Sparks Earliana (No. 10 Johnson)	4	Sept. 16	" 10	8	23	" 17	15	5½	3	13¼	Irregular, angular, deeply corrugated and not at all uniform; flesh soft and watery. Scarlet. Not a desirable variety.
Bonny Best	4	Oct. 8	" 10	7	25½	" 21	13	13¼	3	7¼	Roundish, flattened, very smooth, uniform in size and colour; flesh firm, juicy, slightly acid. Deep scarlet.

Last year, in a test of twenty-one varieties and strains, the most productive six in order of yield were Industry (O.A.C. Selected 1910), Sutton's Satisfaction, Industry (O.A.C. Selected 1910-11), Livingston's Globe, Dobbie's Champion and Bonny Best. It will thus be seen that the three varieties which did best for the two years were Industry, Sutton's Satisfaction and Bonny Best, but Livingston's Globe and Dobbie's Champion are also two very good ones.

POTATOES.

The season of 1912 was a very favourable one for potatoes, and, at the Central Experimental Farm, the best crop for several years was harvested in the experimental plots. New stock was obtained of most varieties and many sorts not hitherto tested were tried. The potatoes from old stock were planted in a separate field, and the yields, while recorded, were not compared with the new stock, the twelve best-yielding varieties given below being all from the new stock. In these test plots there were one hundred and thirty-six varieties, of which sixty-six sets of each were planted. The ground, which had been in clover in 1911, was ploughed early in the autumn of that year and the sod was well rotted when the potatoes were planted on May 30, 1912. The sets were cut so that they would have at least three good eyes each and were dropped one foot apart in rows two and one-half feet apart. They were covered with the hoe to ensure greater uniformity. The ground was kept thoroughly cultivated during the growing season and the plants sprayed with Bordeaux mixture to control late blight, and with a mixture of eight ounces of Paris green and one and one-half pounds of arsenate of lead to a barrel of water to kill the potato beetles. The potatoes were dug on October 7. There was little evidence of rot.

TWELVE MOST PRODUCTIVE VARIETIES OF POTATOES IN UNIFORM TEST PLOTS—1912.

Rank.	Name of Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.		Colour.
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	
1	Dalmeny Hero	580	48	457	36	123	12	White.
2	Eureka Extra Early	563	12	457	36	105	36	"
3	Table Talk	554	24	488	24	66	..	"
4	Conquering Hero	550	..	409	12	140	48	"
5	Rochester Rose	536	48	448	48	88	..	Pink.
6	Delaware	528	..	492	48	35	12	White.
7	Burpee's Extra Early	519	12	479	36	39	36	"
8	Dalhousie Seedling	519	12	378	24	140	48	"
9	Early Hebron	514	48	431	12	83	36	Pink and white.
10	Carman No. 1	510	24	466	24	44	..	White.
11	Houlton Rose	501	36	440	..	61	36	Pink.
12	Clyde	499	24	448	48	50	36	White.

SPRAYING EXPERIMENTS.

Lime Sulphur versus Bordeaux for Potatoes.

An interesting spraying experiment conducted in the Horticultural Division in 1912, was one made for the purpose of comparing the relative value of the lime sulphur wash with Bordeaux mixture in controlling late blight of the potato. Only one spraying was given in this experiment, the date being July 28, 1912. One row 33 feet long of each of the nine varieties, Canadian Standard, St. Patrick, Burpee's

Extra Early, Early Puritan, Emigrant, Rose of the North, Buckeye State, Early Ohio, Bermuda Early and Rochester Rose, was sprayed with a commercial brand of lime sulphur, 1 part in 35 parts of water and Bordeaux mixture made with 6 pounds copper sulphate, 4 pounds lime, to forty gallons water and, for comparison, the same area was sprayed with Paris green, an insecticide only.

RESULTS—Average of nine varieties.

—	Total Yield.		Yield of marketable tubers.		Yield of unmarketable tubers.	
	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
Bordeaux mixture	226	12	169	..	57	12
Lime sulphur	163	36	105	36	58	..
Unsprayed	156	48	92	24	64	14

A difference in favour of Bordeaux mixture in the total yield of 62 bushels, 36 pounds per acre, and in yield of marketable potatoes of 63 bushels, 36 pounds per acre.

ORNAMENTAL GARDENING.

In previous annual reports of the Horticultural Division, and in bulletins, considerable information has been given by the writer in regard to trees, shrubs and herbaceous plants tested at the Central Experimental Farm. Short descriptions have in many cases been published of varieties considered best for ornamental planting and, in some cases, cultural directions based on experience at Ottawa have been given.

In 1897, lists were published of one hundred of the most ornamental hardy trees and shrubs, and also one hundred of the best herbaceous perennials. In 1898, an additional list of good perennials was given. In 1899, a list was published of some good low-growing flowering shrubs, and also an additional list of good perennials. In 1900 there was given a list of the best hardy, woody, and annual climbers. In 1902, a list of best spring flowering perennials. In 1903, a list of deciduous trees, shrubs and climbers with attractive foliage, bark and fruit. In 1904, a list of the genera of trees and shrubs in the arboretum, with the number of species of each; and, in 1899, there was published a catalogue of the trees and shrubs in the arboretum which had been tested up to that date, with notes regarding hardiness.

In the annual report for 1906 a list of thirty of the best hardy flowering shrubs was given, with short descriptions. In the annual report for 1909 was published a list of the best twenty-five hardy ornamental deciduous trees, a list of best twenty-five hardy evergreens, and a list of the best lilacs, with short descriptions. A descriptive list of the best philadelphus or mock orange appeared in the report for 1910. Finally, in 1912, an article on 'Hardy Roses and their Culture' was published in the annual report and also in bulletin form.

In 1911, Mr. F. E. Buck, B.S.A., was appointed to assist the writer in ornamental gardening and, during the past three seasons, considerable experimental work has been in progress which will be reported upon as rapidly as the material can be got into order. Especial attention has been paid to annuals, and following is an article prepared by Mr. Buck on 'Everlastings' which will no doubt be read with much interest:—

Everlasting Flowers

BY

F. E. Buck, B.S.A., Assistant in Ornamental Gardening.

Amongst popular annual flowers grown in European countries, those known as 'Everlastings' hold a conspicuous place. They retain their shape, colours, etc., after being dried, and will last for months, even several years, when gathered at the right stage.

In France, the French Immortelles (*Helichrysum arenarium,* and the *Xeranthemums*) are used extensively in the manufacture of memorial wreaths and crosses. Large quantities of these and other varieties known under the same general name of 'Everlastings' are exported from both France and Germany to all parts of the world. In some instances, the flowers are bleached white and then dyed in various colours.

In 1912, a collection of the seed of these flowers was ordered from two well-known seed firms, and sown with the seeds of other annuals under test for that season. Amongst the collection of several hundred varieties of annual flowers, the 'Everlastings' grew as luxuriantly as most, gave more blossoms per plant than most, and continued in flower for a longer period than the majority of the others.

The varieties grown were as follows:—

1. *Helichrysum.* . .

The 'Common Everlasting' of English and American gardens, *Helichrysum bracteatum*) selected varieties in six colours, viz., golden yellow, pink, scarlet or red, silver white, purple and cream or buff. It is generally considered that these do best in a sandy type of soil. They were planted (as were all the everlastings) in a sandy soil. A good supply of rain fell in 1912 and the *Helichrysums* not only grew taller than usual but bloomed most profusely during a period of two to three months. Repeated cutting encouraged further growth. The flowers of the *Helichrysums* are from one to two and a half inches across and resemble slightly the annual asters. Height, three feet to five feet.

2. *Acroclinium.*

These are 'Everlastings' somewhat resembling a large daisy. The plants grow about fifteen inches to eighteen inches high. They are to be had in two colours, white, and a pretty shade of rose pink. They are sold as singles and doubles, but at Ottawa nearly all the flowers have come either double or semi-double. The flowers are produced singly on stalks growing from the base of the plant. For this reason, it is easy to cut them with long stems and at the right stage for drying. They are less stiff-looking than the *Helichrysums* and quite pleasing in appearance as a cut flower in vases. They are also quite useful grown as ordinary flowers in borders and by picking off the old heads may be kept in bloom for ten weeks or more. The flowers vary from three-fourths of an inch to one and a half inches across.

3. *Rhodanthe.*

This little 'Everlasting' does not grow much over a foot high, but it has a European reputation because of its graceful habit of growth. The nodding heads, pink in colour, on long pedicels retain their grace when dried. The flowers are about three-quarters of an inch across. The blooming season is not so long as of the two former 'Everlastings,' about eight weeks being the limit. It does well, and looks well, grown in either borders or beds.

4. *Ammobium.*

Ammobium altum derives its varietal name from the broadly-winged branches which give it a distinctive appearance as a plant. The flowers are rather small and for that reason less valuable than the three former, and, since there are several to a branch, it is more difficult to cut the *Ammobium* at the right stage for drying. When cut at the right stage they may, however, be used to good advantage to mix in with other 'Everlastings.' The flowers are silvery-white, about three-quarters of an inch across, and somewhat like a small daisy. The plant is rather straggling in habit of growth.

5. *Helipterum.*

Helipterum Sandfordi is the least attractive of the 'Everlastings.' It is bright yellow in colour and in habit of growth somewhat resembles a dwarf type of 'Golden-rod.' It is useful for mixing in with the other 'Everlastings.' Height, about one foot.

6. *Gomphrenas.*

The Gomphrenas are also 'Everlastings' and the only ones possessing a common name. They are known as 'Globe Amaranths,' and are to be had in about six colours, the most attractive of which are *rosea, rubra* and *aurea superba.* The flowers are globular in form and rather stiff-looking. Plants grow about one foot high. They are quite tender to frosts. As a greenhouse plant they do very well.

Botanical Note.—All of the above plants, with the exception of the last one, belong to the Compositæ. They are all natives of either South Africa or Australia. The genus *Helichrysum* contains several hundred species, but only those noted are of commercial value. *Rhodanthe, Acrocliniums* and *Ammobiums* are included in the genus *Helipterum* and have received these special horticultural names on account of the marked differences in the habits of the plants. The *Ammobium* is a sand-loving plant from Australia.

The Globe Amaranths (*Gomphrena globosa*) belong to the family Amarantaceæ, and are also sometimes called, with other plants, Bachelor's Buttons. The showy bracts hide the true flowers.

Xeranthemum and other Everlastings.

Note.—The well-known Xeranthemums (French Immortelles) are under test this year (1913) and promise to take a high place in the list of everlastings. Several of the ornamental grasses which may be used with good effect with most of the everlastings are also included in the 1913 trials. Other 'Everlastings,' including the native 'Pearly Everlasting' and 'Cudweed,' while not possessing commercial value, are sometimes grown. Such are under observation and if any are found worthy will be reported on later

Notes on Culture.—The seed of these plants was sown in flats about the middle of April and the young plants put out the first week in June. By July 21, most were in flower and they continued to bloom till early in November, the *Helichrysums* withstood several degrees of frost. Seed may also be sown in the open ground the latter part of May. In such cases, the plants will not bloom till about the first week of August. The plants should be thinned out to about six inches apart.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT—J. A. CLARK, B.S.A.

AREA.

The area now devoted to horticulture, including wood-lots and avenues, is about twenty-one acres.

The wood-lots and avenues were cleared of much of the underbrush, a splendid picnic ground being prepared in the grove just north of the Station buildings. New avenues and roads were opened up as needed and kept in good condition by the occasional use of the split-log drag.

TREE FRUITS.

APPLES.

The season of 1912 was an off year with the most of the fruit trees in the old orchard at the Experimental Station, one section of a Red Quarrenden tree being an exception. This tree was stripped of its bloom on one side several years ago and has since that time produced a crop every year on alternate sides.

No fruit was borne in the new orchard that was set in the spring of 1910. These trees have made a strong, vigorous growth and have not been injured to any extent by insects or diseases, as shown by the small percentage of loss (5·6 per cent in three years) from all causes, including accidents. An addition of forty trees was made to the orchard early in May, 1912.

CHERRIES.

The cherry orchard gave profuse bloom, which was injured to some extent by frost. Quite a number of the trees bore fruit, but it was taken by the robins before it was fully ripe.

PLUMS.

The plum trees have made very strong, vigorous growth. The trees have been free from disease or insects. They have been sprayed regularly at the same time as the apples with lime-sulphur, and up to the present have been entirely free from black-knot, which has caused so much damage to plum trees throughout the province.

PEARS.

The pear trees have grown the best, and are the most thrifty trees at the Station. Only one tree has died since planting. It was killed by an accident. Two trees of the Lucrative variety were loaded with excellent fruit.

SMALL FRUITS.

The small fruit plantation gave highly satisfactory returns during the season.

GRAPES.

The grape vines that were set in 1910 were heavily loaded with fruit. Among these the Delaware and the Golden Drop matured before the others and were of good flavour. The Lindley and the Worden were much heavier yielders, the fruit being only fair quality.

Among the vines set in 1911, the Moyer ripened a small quantity of fruit. This variety is the earliest that has been tried at this Station, and gives promise of being the most satisfactory for this climate.

CURRANTS.

The red and white currants were loaded to the ground with fruit in 1912. There is no demand for this fruit in Prince Edward Island as it is scarcely used at all. A trial shipment was made to Nova Scotia, but the returns, after payment of freight, etc., were small. The Greenfield gave the best yield of red currants, and the Large White the best yield among the white varieties.

The black currants gave a fair yield. The bushes are strong and should be in full bearing next season. The demand is much greater than for either red or white, and they command a good price. The Saunders variety gave the largest yield; the fruit being of medium size and of good quality.

GOOSEBERRIES.

The gooseberry bushes grew well and gave a fair average crop of fruit. The currant worm appeared several times, but they were destroyed while in groups, before they spread over the bush. We did not find it necessary to use poison. The Houghton and Smith's Improved gave much the largest yields.

RASPBERRIES.

Among the varieties of raspberries tested, the Herbert (red) led in yield, with Shaffer (purple) a close second. The Columbian (purple) and the Cuthbert (red) are also two excellent varieties that gave large yields. The Golden Queen, a white variety, had a very long season, but gave rather a small total yield. The Black-cap varieties were all so badly infected with 'Anthracnose' that they were pulled up and destroyed.

DEWBERRIES.

Many of the Lucretia dewberry plants were injured by frost. Those which wintered gave good yields of most delicious fruit; the period of fruiting being almost as extended as that of the Golden Queen raspberry. This fruit was difficult to sell, as it was not known here. The plant is not nearly so hardy as the red raspberry.

BLACKBERRIES.

Three varieties of blackberries were set in 1910 but have been killed back every winter, so that, while the new canes grew strong and large, no old canes remained to produce fruit.

STRAWBERRIES.

The strawberries were the most satisfactory fruit grown at the Station during the season. Two dozen varieties were grown. With the exception of some fruit destroyed by continuous heavy rains, the fruit was harvested and marketed in excellent condition.

The Excelsior was the earliest fruit ripe, but gave rather a light crop of poor quality. The Warfield and Clyde were the leaders, the Warfield being an excellent shipping berry, along with its heavy yielding qualities. The Parker Earle was the latest to produce good fruit. Bederwood and Splendid are two varieties that are recommended.

TREES AND SHRUBS.

The trees and shrubs on the lawns about the Station buildings and along the avenues made good growth during the summer, many of them being very showy. Among these might be mentioned *Daphne Mezereum,* blooming before the crocus; *Spiræa arguta,* which was a mass of white bloom during June, and *Hydrangea paniculata grandiflora* with its abundant bloom in the late autumn. The belt of land along the railway, that was planted to shrubs, was seeded down to lawn which improved the front of the Station very much.

VEGETABLES.

About 150 plots of garden vegetables were tested in 1912. Brief mention will be made of only a limited number of these. Club-root (*Plasmodiophora Brassicæ* Wor.) injured both cabbage and cauliflower to some extent. The cutworms appeared in large numbers, but were controlled by scattering poisoned bran along the rows.

ASPARAGUS.

The early asparagus was killed back with frost on May 22, but came on well later and gave a fair crop.

BEETS.

The table beets all gave a return of more than 15·0 tons per acre. The Ruby Dulcet and Egyptian Dark Red turnip being ready for use before the others.

BEANS.

The wet season caused considerable anthracnose among the beans. While they produced a large quantity of green beans, they did not ripen evenly or well for shelling or seed purposes.

BRUSSELS SPROUTS.

The Brussels Sprouts grew splendid stalks covered with excellent heads. Many of the heads were infested with a small green worm similar to a cabbage worm.

CABBAGE.

Sixteeen varieties of cabbage were grown. Early Paris Market and Early Jersey Wakefield were good for early market. The Improved Amager Danish Ballhead and the Extra Amager Danish Ballhead gave the largest yield of good heads.

CAULIFLOWER.

Except for the few that were injured with Club-root, the cauliflower gave good returns, the Early Snowball doing best.

CARROTS.

Three varieties of table carrots were grown, the Half Long Chantenay being the best.

CELERY.

The season was favourable to celery, and all the varieties did well. The Rose Ribbed Paris, though not producing as high a yield as some others, was the favourite. French Success, Paris Golden Yellow and Evans Triumph were the heaviest yielders.

CORN.

The corn grew well and formed many ears but owing to the most unfavourable weather for many years for corn, the great bulk of it did not mature. Not any ripened enough for seed. Early Evergreen, pulled September 2, was the first fit for use.

CUCUMBERS.

Among the three varieties tested, the Peerless White Spine was both earlier and more prolific than the others.

LETTUCE.

The thirteen varieties of lettuce were all so good that it was impossible to state which was the best. The Grand Rapids and Wheeler's Tom Thumb were favourites.

ONIONS.

Among the onions, the Large Red Wethersfield and Danvers Yellow Globe led. It was found best to leave the plants so close in the row that they crowded one another half out of the ground. This caused them to ripen more quickly.

PEAS.

The early garden peas gave large returns; Heroine and Premium Gem leading a list of twelve.

RADISH.

Both the Forcing Turnip Scarlet and the Turnip Early Scarlet White Tipped radish were satisfactory.

RHUBARB.

Ten varieties of rhubarb set in the autumn of 1911 made good growth and gave a fair crop.

SQUASH.

Of the seven varieties of squash tested the Long Vegetable Marrow and the Hubbard proved to be heavy yielders and the best keepers.

SALSIFY.

Salsify or Oyster Plant, which is a very promising vegetable, gave a splendid crop.

TOMATOES.

The dull wet season delayed the ripening of the tomatoes. A very good crop, however, was harvested. Bonny Best was slightly ahead of three strains of Sparks' Earliana received from the Central Experimental Farm. Rennie's XXX Earliest, though not so heavy a yielder, ripened as soon as the earliest strain of Sparks' Earliana.

POTATOES.

The potato crop of 1912 was above the average. When dug, there was very little rot reported. They afterwards kept well. The seed was kept in the cellar of the Superintendent's residence. The potato plants came up all right; shortly afterwards, however, it was noticed that many of the plants in certain varieties appeared stunted. They

remained stationary in growth. These affected plants did not produce any saleable tubers. Samples of the injured plants were sent from time to time to the Division of Botany, Central Experimental Farm, Ottawa, Canada, and Mr. Eastham made two personal visits during the season to the field. Upon investigation it was found that seed from this cellar had proved worthless for seed in former years. There were several inquiries from farmers describing a similar trouble in their potato fields. Nothing definite has yet been learned except that all of the seed potatoes obtained from other sources and planted at this Station were free from the trouble.

In the table that follows, the varieties of potatoes numbered from 1 to 8 were obtained from outside sources. Nos. 9 to 28 were all kept in the cellar referred to, at a low, almost constant, temperature. Conditions seemed as good as they could be made.

It will be noticed that some varieties were much more resistant than others. The number of vigorous plants in each case is given, in the computed area. In the second part of the table the results are computed from 66 actual stalks, dug from a continuation of the same row, in order to obtain the number of vigorous plants there should have been in the measured area.

The seed was cut in four, being split from end to end and then across the middle of the potato. The plants were sprayed regularly every ten days throughout the growing season with Bordeaux containing Paris green.

The land was a sandy loam, well manured with stable manure, which was worked thoroughly into the land two weeks before the seed was planted. The yield per acre was computed from the weight of one row 66 feet long. The sets were planted on May 22, and the tubers dug on October 7. No rot was found in any of the varieties.

Potatoes.—Test of Varieties.

Name of Variety.	No. of Vigorous Plants.	Total Yield.		Part I. Results computed from 1·264 acre— Marketable.		Unmarketable.		Part II. Results computed from 66 vigorous plants— Total Yield.		Marketable.		Unmarketable.	
		Bush	Lb	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
1. Lion's Paw	59	519	28	484	08	35	20	556	19	519	45	36	34
2. Table Talk	42	510	15	439	57	70	24	683	22	600	19	83	03
3. Orwell Square	58	492	56	458	17	34	39	536	47	501	52	34	55
4. Fitzgerald	54	443	18	413	36	29	42	493	37	465	59	27	38
5. Wee McGregor	58	428	43	402	36	26	07	493	20	463	55	29	25
6. Green Mountain	54	421	09	373	02	48	07	484	41	435	19	49	22
7. Selina Burbank	46	407	41	393	56	13	45	486	28	445	38	40	50
8. White Rose	60	368	06	336	29	31	37	374	08	342	14	31	54
9. McIntyre	41	450	12	391	19	58	53	643	21	578	44	64	37
10. Gold Coin	44	442	28	419	22	23	06	530	06	505	35	30	31
11. Dreer's Standard	54	439	19	393	07	46	12	493	12	439	02	....	
12. Vick's Extra Early	47	416	24	386	44	29	40	500	55	467	22	33	33
13. Empire State	37	345	57	305	48	40	09	506	08	403	14	42	54
14. Ashleaf Kidney	31	344	41	310	43	33	58	556	03	508	45	47	18
15. Carman No. 1	40	335	46	284	29	51	17	483	02	434	30	48	32
16. Rochester Rose	31	273	25	227	01	46	24	381	33	335	05	46	28
17. Rural New Yorker	39	267	18	236	55	30	23	361	12	327	31	33	41
18. Everett	31	252	02	225	30	26	32	457	02	397	55	59	07
19. American Wonder	19	233	55	200	12	33	41	592	37	528	00	64	37
20. Irish Cobbler	21	232	38	185	04	47	34	348	50	299	53	48	57
21. Hard to Beat	29	222	20	172	58	49	22	276	38	211	28	65	10
22. Burbank's Seedling	24	184	47	144	55	39	52	403	00	336	11	66	49
23. Late Puritan	20	168	42	155	22	13	20	526	45	467	38	59	07
24. Factor	26	168	26	117	01	51	25	290	24	215	03	75	21
25. Up to Date	43	168	18	101	53	66	25	272	56	168	18	104	38
26. Sutton's White City	23	146	34	110	49	35	45	260	59	199	18	61	41
27. Money Maker	14	123	20	109	35	13	45	428	13	398	21	29	52
28. Morgan's Seedling	9	119	04	77	49	41	15	580	48	490	54	89	54

All the experiments were more or less affected by the injury mentioned previously, so that the data should be considered relatively only.

An experiment was conducted with Rural New Yorker potatoes to determine the effect of certain fertilizers in conjunction with an application of barnyard manure, which was applied evenly on all the plots at the rate of 22 tons per acre.

Experiments with Potatoes.

DIFFERENT Applications of Fertilizers.

Row.	Treatment. Pounds per Acre.			Total Yield per Acre.		Yield of Marketable per Acre.		Yield of Unmarketable per Acre.	
	N H_4	P_2 O_5	K_2 O	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
a	...	350	200	289	51	251	54	37	57
b	250	350	200	356	24	308	..	48	28
c	..	175	100	316	48	281	36	35	12
d	125	175	100	355	18	304	42	50	36
e	400 pounds basic slag.			243	06	220	..	23	06
f	Check.			220	..	186	20	33	40

An experiment was conducted with Burbank's Seedling to determine the best date to plant potatoes.

DIFFERENT Dates of Planting Potatoes.

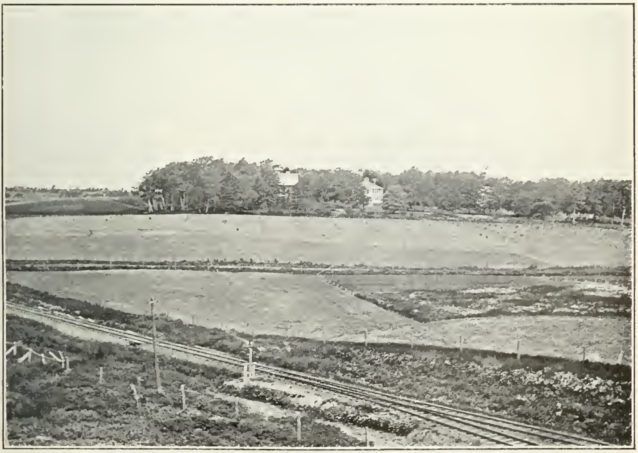
Row.	Date of Seeding.	Total Yield per Acre.		Total Yield of Marketable.		Total Yield of Potatoes not Marketable.	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
a	May 23	319	..	292	36	26	24
b	" 30	248	36	198	..	50	36
c	June 6	303	36	265	06	38	30
d	" 13	114	24	72	36	41	48
e	" 20	181	46	133	06	48	40
f	" 27	115	30	78	06	37	24

An experiment was conducted to observe the effect of liming sets and not liming them; planting them at once and holding them for one week after cutting.

DIFFERENT Dates of Planting Limed vs. Not Limed Sets.

Row.	Treatment.	Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre Unmarketable.	
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
a	Limed and planted May 23	276	08	233	56	42	12
b	Not limed, planted May 23	199	06	152	54	46	12
c	Limed and planted May 30	193	36	146	18	47	18
d	Not limed, planted May 30	214	30	166	06	48	12

Iris and Pæonies, Charlottetown, P. E. I.



Experimental Station, Charlottetown, P. E. I. Young orchard in distance.

FLOWERS.

The season of 1912 was most favourable for flowers. From early spring until the late autumn the grounds at the Experimental Station were adorned with a profusion of bloom. In the early spring the crocuses and squills unfolded almost in the snow; these were followed by great beds of tulips and narcissus, which bloomed to perfection in this moist climate. As the season advanced, irises in great clusters, then pæonies, great balls of beauty, many coloured, came and went, their beautiful foliage lasting throughout the summer. The annuals all came into competition with the roses, whose period of bloom extended from July 4 until November 16. Each had its own particular beauty; the Perpetual roses being to many the greatest wonder. Eighty-one varieties of sweet peas that were sown April 17, began blooming July 7, and continued until November 4. The average height attained was over 8 feet. Among the many other flowers deserving special mention, the beautiful collection of carnations, which had wintered outside, should have first place. The perennial phlox and asters during their season were very attractive. In the pond to the west of the barn the Kentucky water lilies covered a portion of the surface with their beautiful glossy leaves intermingled with large pink and white blossoms.

Detailed records of all flowers grown were kept for reference.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT—R. ROBERTSON.

Following will be found the Horticultural Report of the Experimental Farm, Nappan, N.S., for 1912-13.

The apple crop of 1912 was above that of 1911 in quantity, but the quality was about the same, this being mostly due to the very wet season and lack of sunshine, which has a tendency to cause a lack of rich flavour and high colour.

The trees in the commercial orchard, which was set in the spring of 1911, made good growth in 1912, having come through the winter very well, there being only four trees which had to be removed in the spring, namely; two Golden Russets, one McIntosh Red and one Blue Pearmain.

A close record has been kept of the cost of planting and care of this orchard, and the details of expenditures are given below.

COST of Commercial Orchard, 1911-12.

Date.	Number of hours manual labour.	Cost.	Number of hours horse labour and teamster.	Cost.	Work engaged at.
		$ cts.		$ cts	
1911........	....	69 50	... ...	25 80	Cost 1911.
April 12, '12	1 man 1 day at $1.70	1 70	1 horse 1 day at $2.70	2 70	Spraying (lime wash).
May 1, '12	2 men ½ "	1 70	....	....	Replacing dead trees.
" 13, '12	2 " 1 "	3 40	....	....	Pruning.
" 30, '12	....	....	1 team 1 day at $3.40	3 40	Harrowing.
June 1, '12	1 man 1 day at $1.70	1 70	1 horse 1 " $2.70	2 70	Spraying (Bordeaux).
" 5, '12	....	....	2 teams 1 " $3.40	6 80	Preparing seed-bed.
" 6, '12	7 bush. mixed grain.	4 20	....	....	For sowing between trees.
" 6, '12	....	. .. ...	1 team ½ day at $3.40	1 70	Seeding.
" 15, '12	....	....	1 horse 1 " $2.70	2 70	Cultivating near trees.
July 2, '12	2 men 1 day at $1.70	3 40	....	....	Hoeing near trees.
" 25, '12	1 man 1 "	1 70	1 horse 1 day at $2.70	2 70	Spraying (Bordeaux).
Sept. 26, '12	1 " ½ "	0 85	1 team ½ " $3.40	1 70	Cutting and stocking grain.
" 28, '12	2 men ½ "	1 70	" "	1 70	Hauling in grain.
		89 85		51 90	

	$ cts.
Manual labour..	89 85
Horse and teamster labour......	51 90
	141 75
By 117 bushels mixed grain at 50 cents.......................	58 50
Total cost..	83 25

SMALL FRUITS.

The small fruit plantation, which was set out in the spring of 1911, came through the winter well, all the currant bushes looking very healthy and yielding a fair crop this summer.

The yield of each variety was kept and is as follows:—

CURRANTS.

Name.	No. of Bushes.	Quality.	Date.	Yield.
		Black.		Quarts.
Climax	5	Good	July 31	8
Victoria	5	"	"	3
Collin's Prolific	5	"	"	3
Trophy	5	Medium	"	3
Ontario	5	Good	"	3
Buddenborgs	5	"	"	6
Saunders	5	"	"	4
Kerry	5	Poor	"	1⅝
Success	5	Medium	"	1
Clipper	5	Good	"	4
Eagle	5	"	"	2½
		Red.		
Greenfield	5	Medium	August 1	2
Red Grape	5	Good	"	6
Cumberland	5	"	"	3
Red Dutch	5	Medium	"	2
Wilder	5	Good	"	2
Victoria	5	"	"	3
Rankin Red	5	"	"	1
Pomona	5	"	"	4
Fay	5	"	"	1
		White.		
Large White	5	Good	August 1	3
White Cherry	5	"	"	2
White Grape	5	"	"	3

STRAWBERRIES.

The strawberry crop of 1912 gave promise of being another large one and the yield was good up to the last two pickings, when the berries were practically ruined by rain storms.

The following are the yields of the twenty best varieties. Size of the plots 16½ feet by 5 feet, or one 528th part of an acre:

Name.	Date and Pickings.					Yield per plot.	Yield per acre.
	July 4	July 7	July 14	July 20	July 22		
						quarts	quarts
Parker Earle	4	5	11	3	1	24	12,572
Crescent	3	6	10	1	2	22	11,616
Pearl	2	4	7	5	4	22	11,616
Lovett	2	6	6	4	3	21	11,088
Warfield	1	6	5	4	2	18	9,504
Paris King	3	7	5	3	....	18	9,504
Capt. Jack	5	3	7	3	....	18	9,504
Princess	....	8	5	3	....	17	8,976
Carrie	....	5	6	3	3	17	8,976
Beder Wood	4	4	3	4	2	17	8,976
Haverland	4	6	4	3	....	17	8,976
Ida	....	4	8	3	1	16	8,488
G. H. Coughill	....	4	6	4	2	16	8,448
Early Beauty	2	7	3	4	....	16	8,448
Splendid	1	6	5	3	1	16	8,448
Michel Early	4	5	3	2	2	16	8,448
Morgan Favorite	1	3	3	8	....	15	7,920
John Little	....	3	3	5	4	15	7,920
H. W. Beecher	....	5	4	4	2	15	7,920

VEGETABLES.

Experiments with potatoes.

Nineteen varieties of potatoes were grown in uniform test plots of one-hundredth acre each, in rows thirty inches apart in the drill. The seed was cut with two strong eyes to the set, and planted in the rows one foot apart.

The soil was a sandy loam on which clover hay had been grown the previous year. A light dressing of manure was applied and ploughed under. The land was again ploughed and well harrowed, and complete fertilizer applied at the rate of 400 pounds per acre. The drills were harrowed down about the time the potatoes were coming up, and again rowed up.

The plants were sprayed three times during the season, with Bordeaux mixture, Paris green being added on two occasions to destroy potato beetles. Planted June 8, and dug October 3 and 4.

POTATOES.

Name of Variety.	Planted.	Dug.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
			Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	
1. Ashleaf Kidney........	June 8.	Oct. 3 & 4	413	20	341	40	71	40	Flat round, white.
2. Wee McGregor.........	" 8	"	410	00	323	20	86	40	Oblong, white.
3. Table Talk.............	" 8	"	408	20	301	40	76	40	" "
4. Rochester Rose..........	" 8.	"	401	40	286	40	115	00	Round, red.
5. Vick's Extra Early......	" 8.	"	400	00	350	00	50	00	Long, white.
6. Everett.............	" 8.	"	388	20	305	00	83	20	Pink.
7. Money Maker........	" 8.	"	385	00	288	20	96	40	Long, white.
8. Gold Coin............	" 8.	"	383	20	291	40	91	40	Round, white.
9. Irish Cobbler...........	" 8.	"	380	00	295	00	85	00	" "
10. Reeve's Rose............	" 8	"	363	20	280	00	83	20	Pink.
11. Empire State..........	" 8.	"	353	20	281	40	71	40	Long, round, white.
12. American Wonder....	" 8.	"	330	00	233	20	96	40	" " "
13. Late Puritan	" 8.	"	326	40	253	20	73	20	" " "
14. Dreer's Standard........	" 8.	"	321	40	228	20	93	20	Round, white.
15. Carman No. 1...........	" 8.	"	308	20	230	00	78	20	" "
16. Morgan Seedling........	" 8.	"	288	20	211	40	76	40	Long, round, pink and white.
17. Hard to Beat.........	" 8.	"	240	00	200	00	40	00	Round, white.
18. Dalmeny Beauty......	" 8.	"	211	40	178	20	38	20	" "
19. Factor..................	" 8.	"	171	40	133	20	38	20	" "

A further test was given to potatoes by planting in rows different distances apart, and dropping the sets different distances apart in the rows, with the following results:

Variety.	Planted.	Dug.	Distance apart of Rows.	Distance apart of Sets.	Yield per Acre.		Yield Marketable.		Yield Unmarketable.	
					Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
Carman No. 1	June 8......	Oct. 8......	30 in......	12 in.......	361	40	251	40	110	
" " 1	" 8	" 8....	33 in.......	14 in.......	348	20	266	40	81	40
" " 1	" 8.....	" 8......	36 in.......	15 in.	266	40	175	..	51	40

GARDEN VEGETABLES.

PEAS.

The seed was sown on the 3rd of June in two rows 32 feet long, one of which was allowed to ripen for seed and the other picked, of which a close record was kept.

Variety.	Remarks.				Dates of Picking and Yield.						Total.
	Fit for Use.	Quality.	Length of Pod.	Size of Pod.	Date.	Lb.	Date.	Lb.	Date.	Lb.	
Thomas Laxton...	July 13	Good ..	3½-4 in.	Large ..	July 15	18	July 21	11	July 27	9	38 lb.
Sutton's Excelsior.	" 17	" ...	3½-4 in.	" ..	" 19	18	" 27	3	....	....	21 "
Telephone	" 21	" ...	4 in.....	" ..	" 27	11	Aug. 3	9	....	....	20 "
Premium Gem....	" 21	" ...	3 in.....	Medium	" 21	13	July 27	6	....	....	19 "
Stratagem	" 18	" ...	3½-4 in.	Large ..	" 19	3	" 27	5	Aug. 3	6	14 "
Gradus..........	" 24	Medium	3 in.....	Small ..	Aug. 3	11	Aug. 6	3	....	....	14 "
American Wonder.	" 12	"	3 in.....	Medium	July 19	5	July 27	3	Aug. 3	4	12 "

BEANS.

The beans were sown on the 3rd June, in duplicate rows 32 feet long, one of which was allowed to ripen for seed and the other picked, of which a close record was kept.

The row which was left to ripen did not get a chance to dry before cold weather.

Variety.	Remarks.				Dates of Pickings and Yields.						Total.
	Fit for Use.	Quality.	Colour.	Length of Pod.	Date.	Lb.	Date.	Lb.	Date.	Lb.	
Early Refugee....	June 23	Good...	Good...	5 in....	June 23	7	June 27	12	July 3	11	30 lb.
Wardell's Kidney.	" 15	Very "	" ...	5 " ..	" 17	10	" 23	7	June 29	3	20 "
Valentine.	" 29	Good...	" ...	4½ " ..	" 29	8	July 1	7	July 3	3	18 "
Dwarf Extra Early	July 3	" ...	" ...	4 " ..	" 3	11	" 7	4	....	....	15 "
Landreth's Double Barrelled	June 30	Medium	" ...	5 " ..	Aug. 3	7	....	..	....	....	7 "

TOMATOES.

The seed was sown in the hotbeds on the 8th of April, they were pricked off into strawberry boxes the 1st of May, and remained there until the 20th of June, when they were transplanted into the open. Each plot consisted of ten strong plants, being set five feet apart each way, giving good room for cultivation and sunshine.

The season was not at all suitable for the ripening of fruit, the weather being too dull, but there was a very good set of fruit, which was nearly all harvested green. A record was kept of each plot, and is given below.

Variety.	Date of Pickings and Yields.								
	Date.	Lb.	Date.	Lb.	Date.	Lb.	Date.	Lb.	Total.
Matchless	Sept. 14	15	Sept. 19	20	Sept. 22	19	Sept. 23	3	57 lb.
Livingston Globe	" 15	11	" 18	14	" 22	10	....	......	35 "
Sparks' Earliana................	" 5	7	" 8	10	" 14	17	....	....	34 "
Trophy	" 11	12	" 14	14	" 19	20	....	....	46 "
Bonny Best	" 9	5	" 13	9	" 15	5	....	....	19 "
Rennie XXX	" 17	7	" 22	11	....	.....	....	.....	18 "
Chalk's Early Jewel....	" 14	9	" 19	3	....	......	... .	....	12 "

CABBAGE.

The cabbage was sown in the hotbeds on the 6th April and pricked off on the 29th April; where they remained until the 5th June, when they were transplanted to the open, in two rows 32 feet long and 3 feet between the rows.

Following is a record kept of the different yields:—

Variety.	Dates of Harvesting and Yields.								
	Date.	Lb.	Date.	Lb.	Date.	Lb.	Date.	Lb.	Total.
Early Jersey Wakefield	July 18	64	July 22	83	July 30	22	....	......	169 lb.
Early Paris Market	" 18	91	" 22	72	" 30	35	....	....	198 "
Extra Early Midsummer Savoy	" 19	42	" 27	64	" 30	11	....	.....	177 "
Danish Ballhead	" 22	45	" 30	61	....	......	Aug. 1	18	124 "
Large Low Flat Drumhead	" 3	42	" 7	64	" 15	71	....	....	117 "
Fottler's Imp'd. Brunswick	" 10	47	" 18	64	" 30	11	....	......	139 "
Small Lubeck	" 14	39	" 18	49	" 30	11	....	......	99 "
Small Erfurt	" 14	34	" 18	49	" 22	32	.... ..	......	115 "
Winningstadt	" 22	64	" 30	22	......	....	Aug. 7	11	97 "

CAULIFLOWERS.

Variety.	Date.	Lb.	Date.	Lb.	Date.	Lb.	Total.
Danish Giant	July 30	11	Sept. 10	22	Sept. 18	30	63 lb.
Early Snowball	" 27	31	" 10	30	" 18	17	78 "
Extra Selected Early Erfurt Dwarf	....	.....	" 5	11	" 15	7	18 "

MUSK MELONS.

Musk melons were planted in the hotbeds on the 4th March and germinated very slowly. They were transplanted out in the open on the 3rd June where they grew very slowly, the melons only being about half size when the frost set in.

The following varieties were tried:—

MUSK MELONS.

Hackensack,
Hoodoo,
Montreal Market,
Emerald Gem,
Paul Rose,
Earliest Ripe.

WATER MELONS.

Cole's Early
Ice Cream.

LETTUCE.

The lettuce was planted in the open on the 3rd June, and all producing good heads, with the exception of Grand Rapids which seemed to germinate slowly.

The following are the varieties which were planted:—

Cos Trianon,
Black Seeded Simpson,
All Heart,
Impd. Hanson,
Red Edge Victoria,
Grand Rapids,
Giant Crystal Heart,
Iceberg.

CORN.

The corn was planted on the 5th June. It all germinated and made good growth until about the 22nd July, when the wet weather set in, retarding the growth so that none of the plots ripened. The following varieties are planted:

Malakoff,	Black Mexican,
Fordhook Early,	Stowell's Evergreen,
Golden Bantam,	Country Gentleman,
Early Evergreen,	Henderson's Metropolitan.

CELERY.

The celery was planted in flats in the hotbeds on the 4th April, and after being pricked out was allowed to harden off in cold frames, until the 30th May, when it was planted out in the open.

Trenches were dug about fourteen inches deep and six feet apart. In the bottom of each trench three to four inches of manure was put, and then covered with loose earth to the thickness of two inches, and into this we set the plants, one hundred in each row.

Notwithstanding the wet season there was a very good percentage of edible heads in the fall.

The following is the percentage of the different varieties:—

	Per Cent.
Paris Golden Yellow	95
Giant Pascal	70
Rose Ribbed Paris	70
French Success	60
Nolls Magnificent	75
Evans Triumph	90

FLOWERS.

Both annuals and perennials gave very prolific bloom in 1912. The following are the annuals which do well with us:—

Asters,	Candytuft,	Gaillardia,	Papaver,	Stocks,
Abronia,	Clarkia,	Larkspur,	Petunia,	Nasturtium.
Ageratum,	Celosia,	Mignonette,	Phlox,	Zinnia,
Brachycome,	Coreopsis,	Nemesia,	Portulaca	
Balsam,	Dianthus,	Nicotiana,	Poppy,	

TREES AND SHRUBS.

No additions have been made to the arboretum during the year. The trees and shrubs are a source of great interest to the visitors to the Farm. There has been satisfactory growth and no serious ravages from insects or other pests. The shrubs have, as usual, produced a wealth of bloom. Those worthy of special mention are: Tartarian honeysuckle, Caragana frutescens, common lilac, Japanese lilac, Josika's lilac and Spiræa Van Houttei.

Ravine, Experimental Station, Kentville, N.S.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT—W. S. BLAIR.

This is the first annual horticultural report of the Kentville Experimental Station.

APPLE ORCHARD.

In the spring of 1912 there were about 21 acres planted to apple trees, constituting the first orchard planted at the Station. Part of this orchard is comprised of a block of 4½ acres planted 20 by 20 feet apart, the permanent trees being 40 feet apart each way. The varieties used as permanent trees are Blenheim, Ribston, Nonpareil, Hubbardston and Crimson Beauty. The fillers used in this block are Wagener, Wealthy, Milwaukee, Duchess, Ontario, Cox's, Orange and Yellow Transparent.

It is proposed to adopt various methods in the removal of the fillers in this block to determine, if possible, how long fillers can be economically allowed to remain.

The remainder of the block was planted 40 by 40 feet apart, the following varieties being used: Northern Spy, Baldwin, R. I. Greening, Fallawater, Wellington, King, Gravenstein, Ben Davis, Gano, Banks, McIntosh, Fameuse, Wolf River, Yellow Bellflower (Bishop Pippin), Baxter, Red Astrachan and Dudley (North Star). The varieties Northern Spy, Baldwin, R. I. Greening, King, Ribston and Blenheim have been planted in equal numbers of Ontario and Nova Scotia grown nursery trees to determine the relative value of imported *versus* home grown trees for planting.

The planting included 114 each of Wealthy and Wagener; 38 each of Blenheim, Ribston, Northern Spy, Baldwin, R. I. Greening and King; 19 each of Ben Davis, Gano, Stark, Rome Beauty, McIntosh Red, Fameuse, Baxter, Wolf River, Red Astrachan, North Star, Cox's Orange, Hubbardston, Duchess, Nonpareil, Milwaukee, Golden Russet, Crimson Beauty, Yellow Transparent, Ontario, Tolman, Fallawater, Wellington, Gravenstein and Bishop Pippin.

In addition to the above there were planted the following varieties of apples, from England, with number of trees of each: 2 each of Bramley Seedling, Lord Derby, Lane's Prince Albert, Grenadier, Beauty of Bath, Gladstone, Early Julian, Lord Grosvenor, Early Victoria, Stirling Castle, Newton Wonder, Worcester Pearmain, King Pippin, Allington Pippin, Wellington, Gascoyne's Scarlet, Warner's King, Lord Suffield, Peasegood Nonsuch, Cox's Pomona, Devonshire Quarrenden, Tower of Glamis, Summer Pippin, Ecklinville, Norfolk Beauty, Hector Macdonald, Edward VII, Langley Pippin, Ben's Red, James Grieve, Baumann's Winter Reinette, The Houblon, Lady Sudeley, Charles Ross, Wm. Crump and Lord Stradbrooke; 1 each of St. Everard and Encore.

The seeds from a barrel each of King, Northern Spy, Blenheim, Baldwin and Ribston Pippin were sown in the autumn of 1911 with the object of obtaining seedling trees from which it is hoped to raise some good new seedling fruits. A large proportion of this seed germinated and the young trees made good growth in 1912.

SHIPMENT OF GRAVENSTEINS IN BOXES AND BARRELS.

A shipment of 45 boxes and 30 barrels of Gravensteins was made to London, England, during the past season. In order to make sure of the grade being the same

in each case, one-third of the apples from each tree were boxed and the other two-thirds were put into barrels. The shipment was made through the Berwick Fruit Co., Ltd.

The following statement was furnished by the Manager:—

BERWICK, N.S., November 5, 1912.

Trial lot of apples shipped to London.

45 boxes packed by the Experimental Station.
30 barrels packed by the Berwick Fruit Co.

45 boxes sold for 5/6. Total, net, £7/11/10. (Equal to 81 cents per box, or \$2.43 per barrel)	\$36.72
30 barrels sold for 12/6. Total net £10/1 (equal to \$1.62 per barrel)	\$48.74

Extra cost of box packing, including cost of boxes, paper, wrapping and extra handling, 15 cents per box; or barrel, 45 cents.

Packed in boxes, per barrel	\$2.43
Less extra cost	.45
	\$1.98
Packed in barrels	1.62
Packed in boxes netted (cents per barrel more than those packed in barrels)	.36

APPLE THINNING EXPERIMENT.

To determine whether any gain would result from removing some of the fruit from heavily ladened trees, experiments were conducted during the season in an orchard in Berwick, N.S. The variety in this experiment was Gravenstein. The work of thinning was done on July 30. This was about two weeks after the June drop had occurred. The work should have been started ten days earlier for best results. The trees selected were as nearly alike as it was possible to get them and they had apparently the same set of fruit. From the thinned trees all spotted and ill-shaped fruits were removed, and only one apple was left to a fruit cluster. The apples were left from four to six inches apart and were evenly distributed over the tree.

After thinning, the ground under the thinned and unthinned tree was cleaned, and apples falling after that time were counted. This was done to find out whether thinning would prevent the excessive dropping which occurs in Gravensteins if they are heavily filled just before the fruit is mature, and also to get the number of apples each tree had on it to start with. A record was kept of the number of apples thinned from the tree.

It was found that the thinned tree had 3,137 apples and that the unthinned tree had 4,065 apples when thinning started.

Drops from thinned and unthinned trees.

	Tree Thinned.	Tree not Thinned.
Per cent of total set removed by thinning	18·5	
" " which dropped after thinning	12·2	19·1
" " harvested	69·3	80·9

It will be seen that 19 per cent of the total number of apples on the tree at the start dropped from the unthinned tree and that only 12 per cent fell from the thinned tree. There was a lessened drop of 7 per cent from thinning. This falling for the most part occurred from a little over a week before up to picking time. The fruit was picked on September 20, which was before any serious dropping had occurred. Apples which fell from the tree at picking time were not counted as drops.

Increase in Size.

Apples to the barrel from thinned tree.	517
" " unthinned tree.	593
Per cent increase in size from thinning.	12·81

Grade of Fruit.

	Thinned Tree	Unthinned Tree.
No. 1.	70·00	42 00
2.	23·80	38·65
3.	5 60	16·13
Culls.	·60	3 22

This table shows that the thinned tree gave an increase of No. 1 fruit of 28 per cent and thinning decreased the No. 3 fruit 10·53 per cent.

The thinned tree gave 23·29 per cent less crop than the unthinned tree. It will be seen, however, that at the start the unthinned tree had 22 per cent more apples on it. The actual loss from thinning was, therefore, only 1·29 per cent.

From an acre of 40 trees the gain from thinning as indicated by this experiment, at prices realized this year, would be as follows:—

Yield and Value of Fruit per acre.

—	Thinned.			Unthinned.		
	Per cent.	Yield, brls.	Value.	Per cent.	Yield, brls.	Value.
No. 1.	70·	153·12	382·80	42·00	93 60	234·00
No. 2.	23·80	52·06	83·30	38·65	84·80	135·60
No. 3.	5·60	12·25	12·25	16·13	36 00	36·00
Culls	·60	1·31	·33	3·22	7·20	1 80
Total.	100·00	218·74	478 68	100·00	221·00 .	407·40

This shows a total gain of $71.28. The cost of grading and thinning in the thinned tree was 11⅓ cents per barrel. The cost of grading in the unthinned tree was 10 cents. The thinned fruit cost much less to grade, and, as is shown, the thinning in this experiment cost only 1⅓ cents per barrel after extra cost of grading the unthinned is deducted. This made a total cost for thinning of $2.62 per acre, giving a net return of $68.66 per acre in favour of thinning.

Thinning Experiments with Ben Davis, Stark and Greening.

For this work a commercial block of trees nine years old was used. The orchard had trees of Rhode Island Greening and Stark in straight rows, lengthwise of the block, and Ben Davis were used as fillers. The block was divided into six plots, cross-

wise, taking in trees of each variety in each plot. The area in each plot was as follows:—

Plot 1.—General thinning, 1 acre.
Plot 2.—Thinned to 8 inches, ½ acre.
Plot 3.—Thinned leaving one fruit to a cluster, 1 acre.
Plot 4.—Thinned to 6 inches, ½ acre.
Plot 5.—Not thinned, 1 acre.
Plot 6.—Thinned to 4 inches, 1 acre.

All spotted and deformed fruit was removed from all plots thinned.

Plot No 1, General thinning.—This consisted of removing all deformed or spotted fruit and thinning the fruit which was in clusters, to generally one fruit. No rule as to spacing was adhered to. Where the fruit was thick on a branch, fruit was removed, but where the set was light little was taken off.

Plot No. 2, Thinned to 8 inches.—Well-formed fruit was left 8 inches apart. All clusters of fruit were thinned to one apple to a fruit spur.

Plot 3.—The fruit clusters only were thinned, leaving only one apple to a fruit spur.

Plot 4, Thinned to 6 inches.—All clusters were thinned one apple to the fruit spur.

Plot 5, Not thinned.—Check plot.

Plot 6, Thinned to 4 inches apart.—All clusters were thinned one apple to a fruit spur.

The following data were secured in this experiment:—

Thinning Experiments with Ben Davis, Stark and Greening.

—	Plot 1. — General thinning.	Plot 2. — Thinning to 8 in.	Plot 3. — One to spur fruit.	Plot 4. — Thinned to 6 in.	Plot 5. — Check. Unthinned	Plot 6. — Thinned to 4 in.
Ben Davis.						
Apples removed, per cent.	12·28	38·70	22·67	36·00	00·00	23·78
Apples picked No.	5,371	1,609	5,528	1,898	7,080	3,340
Barrels, apples, No.	11·23	4·06	10·60	3·83	13·00	6·39
No. of apples to barrel	477	396	521	495	544	522
Increase in size over check, per cent	12·31	27·20	4·00	9·00	....	4·00
Stark.						
Apples, removed, per cent.	25·33	36·14	18·45	30·95	00·00	
Apples picked, No.	1,238	507	1,184	368	1,777	
Barrels, apples, No.	2·98	1·26	3·05	1·02	3·95	
No. of apples to barrel	415	402	388	360	450	
Increase in size over check, per cent	7·77	10·66	13·20	20·00	....	
Greening.						
Apples removed, per cent.	18·75	32·20	19·78	29·00	00·00	
Apples picked, No.	3,662	1,295	2,000	904	2,718	
Barrels, apples, No.	9·35	3·45	5·28	2·42	6·97	
No. apples to barrel	383	375	379	373	390	
Increase in size over check, per cent	1·80	3·84	2·82	4·36	....	

From the above figures it will be easily seen that thinning in every case materially increased the size of the fruit and that the heavier thinnings as a rule, gave the largest apples.

There are, however, some instances where it appears that heavier thinning beyond a certain stage does not increase the size, as in the Ben Davis plots, where plot 1, with 12·28 per cent apples removed, gives larger apples than plots 3, 4 and 6 where 22·67, 36 and 23·78 per cent respectively were removed

This is probably accounted for by the fact that a favourable variation in plot 1 gave apples which would have been larger in any case.

The other plots which were thinned produced apples, the size of which was governed by the amount of apples thinned from the trees.

In Stark, plot 4, with 30·95 per cent apples removed, produced the largest apples, showing an increase of 25 per cent in size over the check plot.

The size here, however, does not seem to show any relation to the amount of apples, but the fact that in the case of every thinned plot there is an increase in size over the check plot, shows that there is an increase in size from thinning in this variety.

SHOWING the results of Grading in the Different Plots in this Experiment.

—	Plot 1. — General thinning.	Plot 2. — Thinning to 8 in.	Plot 3. — One apple to spur.	Plot 4. — Thinned to 6 in.	Plot 5. — Unthinned check.	Plot 6. — Thinned to 4 in.
Ben Davis.						
Apples removed, per cent..	12·28	38·70	22·67	36·00	00·00	23·78
No. 1, per cent...........	49·15	55·00	50·43	49·22	31·22	44·42
No. 2, per cent	41·65	35·44	41·18	37·80	40·00	40·71
Nos. 1 and 2, combined per cent..................	90·80	90·44	91·61	87·02	71·22	85·11
No. 3, per cent...........	8·34	9·30	8·08	12·60	27·12	13·80
Culls, per cent	·86	.26	·31	·38	1·66	1·10
Stark.						
Apples removed, per cent.	25·33	36·14	18·45	30·95	00·00	
No. 1, per cent	80·95	79·25	76·58	80·63	51·88	
No. 2, per cent	10·32	11·32	12·53	6·98	23·00	
Nos. 1 and 2, combined, per cent.....	91·27	90·57	89·11	87·61	74·88	
No. 3, per cent......	7·67	9·43	8·88	11·63	22·18	
Culls, per cent...........	1·06	0·00	2·00	·77	2·94	
Greening.						
Apples removed, per cent.	18·75	32·20	19·78	20·00	00·00	
No. 1, per cent......	70·66	74·26	82·80	68·52	64·51	
No. 2, per cent	10·81	12·07	8·01	19·38	8·97	
Nos. 1 and 2, combined, per cent...................	81·47	86·33	90·81	87·91	73·48	
No. 3, per cent...........	17·21	12·75	7·51	11·80	24·01	
Culls, per cent............	1·32	·92	1·68	·29	2·51	

It can readily be seen from this table that, in every case, thinning has had the result of increasing the per cent of No. 1's, increasing the per cent of combined No. 1 and No. 2 fruit, and greatly decreasing the per cent of No. 3's and culls.

In Ben Davis, there is an increase on an average of over 18 per cent in No. 1 fruit, and in plot 2, thinned to eight inches, an increase of nearly 24 per cent. In No. 3's in this variety there is a decrease on an average of approximately 17 per cent, and plot 3, with the lowest per cent of this grade, gives a decrease of 19.04 per cent.

In Stark are found the highest per cents of No. 1, and an increase of nearly 30 per cent from thinning. No. 3's have been lowered in the thinned plots from 22 per cent to 7·67 to 11 per cent, or an average decrease of 13 per cent. Of the varieties in this experiment, in the thinned plots Greening shows the least increase of No. 1. This may be accounted for by the fact that the trees were young, not heavily filled and in a very vigorous condition, as is shown by the fact that the unthinned plots gave 64·51 per cent of No. 1 fruit. In the per cents of combined No. 1 and No. 2 we have a decided increase in favour of the thinned plots and have as high as 90 per cent of these grades against 73 per cent in the check plot.

EXPERIMENTAL STATION, STE. ANNE DE LA POCATIERE, QUE.

REPORT OF THE SUPERINTENDENT—JOS. BEGIN.

The Experimental Station at Ste. Anne de la Pocatière, Que., is situated within three miles of the south shore of the St. Lawrence river, about seventy-three miles below Quebec and Lévis. While the winters are severe here, they are tempered somewhat by the nearness of the St. Lawrence river, which remains, in winter, a large body of open water. Because of this, fruits which will not succeed at Ottawa, for instance, do very well at Ste. Anne. An example is the European plum, of which many varieties succeed admirably here. It is proposed to test thoroughly many varieties of fruits, vegetables, and ornamental plants at Ste. Anne and to experiment with different methods of culture in order to determine which is the best for those parts of the province of Quebec where the climatic conditions are the same as at Ste. Anne.

In the autumn of 1912, about three and one-half acres of sandy loam soil were thoroughly prepared for fruit trees. The land, which had been in sod for several years, was ploughed in the summer and kept thoroughly harrowed until winter. In the autumn of 1912, the land was drained by laying parallel rows of three-inch tile, fifty feet apart and about three feet deep, from one end of the area to the other, giving them sufficient fall to carry off the water through a four-inch tile at the lower end. When putting in the tiles, it was planned to have them come midway between two rows of trees so that there would be little danger of the roots filling them.

EXPERIMENTAL STATION, CAP ROUGE, P. Q.

REPORT OF THE SUPERINTENDENT—G. A. LANGELIER.

FRUIT.

APPLES.

Eight out of the twelve Yellow Transparents planted in 1911 produced fruit in 1912. Six Rochelles and twelve Baxters were added to the commercial orchard, whilst two trees of each of the following were put in for variety tests:—

McIntosh seedlings (455), Sorel, Jacob Red, Swayzie seedlings (486), Swayzie seedlings (471), Walbridge x Northern Spy (518), McMahan x Scott Winter (509), Wealthy seedlings (489), seedlings from E. K. Leonard (625), No. 1 from J. J. Persons (632), Salome seedlings (462), Lawver seedlings (460), Spencer Seedless (550), Trenton (493), Choate (636), Swayzie seedlings (541), No. 3 from J. J. Persons (634), Transparent de Croncels (774), Crab-apple from C. N. Vroom (628), Crab-apple from J. D. Hodgson (644), McMahan x Scott Winter (515), Winter St. Lawrence seedlings (470), Lawver x McIntosh (507), McIntosh seedlings (526), Swayzie seedlings (539), American Golden Russet seedlings (487), No. 1 from Wm. Chambers (629), Walbridge x Northern Spy (516), Linton (459), Russian seedling No. 1 (441), McMahan x Scott (514), Rufus (351), Lubsk Queen (573), Russian seedling (436), Fameuse seedling (488), Schoener von Nordhausen (494), Walbridge x Northern Spy (317), seedlings from Mr. Isenor (724), Walbridge x Northern Spy (517), Swayzie seedlings (476), Jewel (crab) (694), Burton (646), Hyslop (crab).

PLUMS.

One out of two Shropshire Damson, one out of two Snider Damson, one out of four Bixby, and the two Fitzroy, planted in 1911, produced fruit in 1912. The following trees were added to the plum orchard:—

Togo (0-612), Mankato (0-614), Yellow European (0-658), Bonne Ste. Anne (0-666), Terry (0-659), Brackett (0-615), Bixby (0-668), Consul (671).

CHERRIES.

One of the six Large Montmorency, planted in 1911, produced fruit in 1912.

BLACK CURRANTS.

The varieties planted in 1911 gave the following yields, in pounds, per acre:—

Climax, 754; Boskoop Giant, 477½; Eagle, 275½; Eclipse, 261; Collins' Prolific, 232; Saunders, 174; Buddenborg, 145; Lee, 145; Kerry, 143; Victoria Black, 101½; Black Champion, 87; Clipper, 87; Topsy, 87; Ontario, 58.

Success was the only one which did not bear.

Six Magnus were put in this year.

RED CURRANTS.

The varieties planted in 1911 gave the following yields in pounds, per acre:—

Red Grape, 812; Cherry, 188½; Victoria Red, 145; Greenfield, 101½; Red Dutch, 101½: Fay, 87; Wilder, 87; Cumberland, 58; Perfection, 14½; Pomona, 14½; Rankin's Red, 10.

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Six bushes each of Red Cross and of Greenfield were added to the plantation this year.

WHITE CURRANTS.

The varieties planted in 1911 gave the following yields, in pounds, per acre:—Large White, 145; White Cherry, 87; White Grape, 87.

GOOSEBERRIES.

The varieties planted in 1911 gave the following yields, in pounds, per acre:—Mabel, 696; Downing, 551; Silvia, 304½; Queen Anne, 275; Gibb, 261; Red Jacket, 203; Industry, 87; Josselyn, 87; Rideau, 87; Saunders, 72½.

Six Houghton, twelve Pearl, and eighteen Downing were planted this year.

RASPBERRIES.

The varieties planted in 1911 gave the following yields, in pounds, per acre:—Columbian, 933 10/16; Eaton, 702 3/16; Herbert 624 7/16; King, 509 9/16; Heebner, 424; Loudon, 266 12/16; Sarah, 133 6/16; Marlboro, 48½.

Twelve Cuthberts put in at the same time as above varieties in 1911, all died.

In 1912, 160 canes were planted; Brighton, 16; Count, 16; Cuthbert, 16; Eaton, 16; Herbert, 32; King, 32; Loudon, 16; Marlboro, 16.

STRAWBERRIES.

The following varieties planted in 1911 yielded, in pounds, per acre:—Bisel, 2,904; New Globe, 2,006 15/16: Grenville, 1,588.

Nettie and Uncle Jim, though put in at the same time, produced no fruit.

The following number of plants were added in 1912: Beder Wood, 50; Bisel, 25; Buster, 50; Clyde, 10; Dunlap, 50; Enhance, 40; Excelsior, 50; Glen Mary, 50; Greenville, 25; Nettie, 50; New Globe, 25; Parson, 50; Ruby, 50; Sample, 50; Splendid, 50; 3 W's, 50; Uncle Jim, 50; Wm. Belt, 50;

GRAPES.

The following number of vines were planted in 1912: Brant, 15; Brighton, 4; Campbell's Early, 2; Canada, 14; Champion, 2; Cottage, 4; Early Ohio, 5; Florence x Potter, 5; Golden Drop, 2; Hartford, 5; Lindley, 5; Manito, 5; McTavish, 2; Merrimac, 5; Moore's Early, 5; Pattison, 3; Peabody, 5; Potter, 5; Potter x Florence, 2; Rogers, 17, 5; Wilkins, 5; Wyoming Red, 2; Yomago, 2.

VEGETABLES.

The past season was one of the most unfavourable in years, continuous wet weather until June 15 keeping back seeding operations, whilst a drought which followed right to the beginning of August delayed germination. The yields were thus exceedingly low. Besides the two hundred and fifteen varieties tested in trial plots, about two acres of vegetables were grown for market, also for seed to be distributed. These were raised between the trees, in the apple orchard.

The celeriac did not germinate; the celery, sown in the greenhouse on March 21 did not grow enough to make it worth while transplanting; the same thing happened to egg plants; all the musk melons and the water melons died after transplanting, and the same varieties sown in the open produced no fruit; the peppers did not produce anything, nor the squashes.

The following tables give comparative yields of some of the more important vegetables:—

BEANS.

Variety.	Length of row.	Ready for use.	Yield in quarts.
Refugee, or 1,000 to 1 (Cap Rouge)	30 feet	Aug. 20	16
" "	"	" 24	15½
Keeney's Rustless Wax	"	" 8	11½
Old Homestead	"	" 26	11
Early Refugee	"	" 8	9½
Wardwell's Kidney Wax	"	July 31	8¾
Stringless Green Pod	"	" 31	8½
Davis Wax (Cap Rouge)	"	Aug. 12	8
Valentine	"	July 31	8
Challenge Black Wax (C. E. F.)	"	" 29	3

BEET.

			Yield in pounds.
Meteor	30 feet	Aug. 2	30
Ruby Dulcet	"	" 2	30
Crimson Globe	"	" 2	29
Early Blood Red Turnip	"	" 6	26½
Egyptian Blood Red Turnip	"	" 8	24
Blood Red Ball	"	" 10	17¼

CABBAGE.

Variety.	No. of plants.	Ready for use.	Yield.	
			Heads.	Pounds.
Express	40	July 7	40	176
Danish Summer Ballhead	40	Aug. 8	39	167
Early "	40	" 24	37	166
Flat Swedish	30	Sept. 14	29	165½
Winningstadt	40	Aug. 24	39	149½
Improved Amager Danish Roundhead	30	Sept. 14	29	149
Early Jersey Wakefield	40	Aug. 17	39	145
" Paris Market	40	" 8	40	144
Large Late Flat Drumhead	30	Sept. 14	29	140
New Early Market	40	Aug. 8	36	138
Copenhagen market	40	" 26	39	136
Extra Amager Ballhead	30	Sept. 19	27	136
Fottler's Improved Brunswick	30	" 5	28	121½
Magdeburg	30	" 14	29	121
Extra Early Midsummer Savoy	40	Aug. 29	37	112½
Small Erfurt	40	" 24	40	110
Autumn King	30	Sept. 5	28	105½
Lubeck	30	" 23	25	99
Danish Delicatesse Red	30	" 14	28	64
Red Danish Stonehead	30	" 14	29	54½

CARROT.

	Length of row.		Yield in Pounds.
Half Long Chantenay	30	July 7	42⅛
Improved Nantes	30	" 7	38⅝
French Horn	30	" 29	35⅝

CAULIFLOWER.

Variety.	No. of plants.	Ready for use.	Marketable Heads.
Veitch's Autumn Giant	40	Sept. 9	30
Danish Giant	40	July 7	12
Extra Selected Early Erfurt Dwarf	40	" 15	7
Early Snowball	40	" 15	6

CORN.

	No. of hills.		Number of Ears.
Malakoff (Cap Rouge)	20	Sept. 10	48
Malakoff (C. E. F.)	20	" 14	48
Fordbook Early	20	Oct. 10	12
Pocahontas (Cap Rouge)	20	Sept. 19	12
Pocahontas	20	" 21	9
Golden Bantam	20	Oct. 10	3
Metropolitan	20	Sept. 19	3
Black Mexican	20	Not fit to use.	
Country Gentleman	20	" "	
Early Evergreen	20	" "	
Golden Rod	20	" "	
Stowell's Evergreen	20	" "	

CUCUMBER.

			No. of Cucumbers.
Giant Pera	3	Aug. 31	11
Short Green (Cap Rouge)	3	Sept. 9	3
Chicago Pickling (Cap Rouge)	3	" 1	2
Cool and Crisp	3	" 1	2
Short Green (Cap Rouge)	3	" 1	2
Peerless White Spine	3	" 1	1
Chicago Pickling (Cap Rouge)	3	Not fit to use.	
Early White Spine (Cap Rouge)	3	" "	
Long Green	3	" "	
Short Green (Cap Rouge)	3	" "	

LETTUCE.

	Length of row.		Marketable Heads.
Black Seeded Simpson	15	July 7	30
Grand Rapids	15	" 6	30
Improved Hanson	15	" 4	30
All Heart	15	" 6	28
Cos Trianon	15	" 9	28
Crisp as Ice	15	" 8	28
Dark Green Capucine	15	" 9	26
Iceberg	15	" 6	25
Big Boston	15	" 12	24
Red Edged Victoria (Cap Rouge)	15	" 6	22
Rousseau Blond Winter	15	" 8	22
Giant Crystal Head	15	" 6	21
Unrivalled Summer	15	" 8	20
Red Edged Victoria	15	" 9	19
Wheeler's Tom Thumb	15	" 12	19

ONION.

Variety.	Length of row.	Ready for use.	Yield in pounds. Market-able.	Yield in pounds. Thick-necks.
Large Red Wethersfield	30 feet	July 25	$\frac{8}{16}$	$15\frac{4}{16}$
" " "	30 "	" 27	$3\frac{8}{16}$	13
Prizetaker	30 "	" 29	$\frac{8}{16}$	$10\frac{8}{16}$
Dark Red Beauty	30 "	" 29	$\frac{7}{16}$	$9\frac{4}{16}$
Danvers Yellow Globe	30 "	" 29	$\frac{2}{16}$	7

PARSLEY.

Variety.	Length of row.	Ready for use.	Yield in pounds.
Double Curled	30 feet	July 22	$10\frac{4}{16}$
Carter's Fern Leaved	30 "	" 26	$6\frac{8}{16}$
Emerald	30 "	" 29	$4\frac{8}{16}$

PARSNIP

New Maltese	30 feet	Aug. 17	$27\frac{8}{16}$
Hollow Crown	30 "	" 17	27

PEAS.

			Yield in quarts
Sutton's Excelsior	30 feet	July 15	$1\frac{7}{8}$
Premium Gem	30 "	" 12	$1\frac{5}{8}$
Juno	30 "	" 27	$1\frac{3}{4}$
Heroine	30 "	" 25	$1\frac{5}{8}$
McLean's Advancer	30 "	" 15	$1\frac{3}{8}$
Stratagem	30 "	" 26	$1\frac{3}{8}$
American Wonder	30 "	" 12	$1\frac{1}{4}$
Gradus	30 "	" 12	$1\frac{1}{4}$
Gregory's Surprise	30 "	" 10	$1\frac{1}{4}$
Telephone	30 "	" 22	$1\frac{1}{4}$
Thos. Laxton	80 "	" 12	1

POTATOES.

Variety.	Length of row.	Ready for use.	Yield in pounds.		
			Marketable.	Small.	Total.
Gold Coin (Nappan)	66 feet	Aug. 8	68¾	1¾	66½
Table Talk (Lacombe)	66 "	" 15	64	9	73
Late Puritan (Nappan)	66 "	" 20	59¾	4½	64¼
Rochester Rose (Nappan)	66 "	" 3	55½	4½	60
Reeves' Rose (Nappan)	66 "	" 3	53	6¼	59¼
Vick's Extra Early (Nappan)	66 "	" 3	51½	1¼	52¾
Money Maker (Nappan)	66 "	" 12	49¼	5½	54¾
Ashleaf Kidney (Nappan)	66 "	" 8	45¾	1½	47¼
Empire State (Nappan)	66 "	" 20	45½	7	52½
Everett (Nappan)	66 "	" 12	42¼	6	48¼
American Wonder (Nappan)	66 "	" 8	41¼	3¾	45
Dreer's Standard (Nappan)	66 "	" 8	40½	2½	43
Irish Cobbler (Nappan)	66 "	" 3	34	4¼	38¼
Carman No. 1 (Nappan)	66 "	" 8	28¾	1½	30¼
Morgan Seedling (Nappan)	66 "	" 15	24¼	3¾	28
Hard to Beat (Nappan)	66 "	" 15	22½	3¼	25¾
Factor (Nappan)	66 "	" 20	16¼	1½	17¾
Dalmeny Beauty (Nappan)	66 "	" 12	9½	2¼	11¾

RADISH.

Variety.	Length of row.	Ready for use.	Yield in dozens.
French Breakfast (Cap Rouge)	30 feet	June 15	21
Forcing Turnip Scarlet	30 "	" 15	19
White Icicle (Cap Rouge (c)	30 "	" 15	18
Forcing Turnip Scarlet (Cap Rouge—b)	30 "	" 15	18
White Icicle (Cap Rouge—b)	30 "	" 15	17⅓
Non plus ultra (Cap Rouge—b)	30 "	" 15	16½
French Breakfast (Cap Rouge—a)	30 "	" 15	16¼
White Icicle (Cap Rouge—a)	30 "	" 15	15½
" " (Cap Rouge—b)	30 "	" 15	15
Rosy Gem (Cap Rouge—b)	30 "	" 15	15
Turnip Early Scarlet (Cap Rouge—a)	30 "	" 15	14½
White Tipped Scarlet	30 "	" 15	12
Turnip Early Scarlet (Cap Rouge—b)	30 "	" 15	11¼
Crimson Giant Turnip Rooted (Cap Rouge—a)	30 "	" 15	11
" " " " (Cap Rouge—b)	30 "	" 15	10¾
Forcing Turnip Scarlet (Cap Rouge—a)	30 "	" 15	9
Crimson Giant Turnip Rooted (Cap Rouge—c)	30 "	" 15	8
Rosy Gem (Cap Rouge—b)	30 "	" 15	8

TOMATO.

Variety.	No. of plants	Ready for use.	Yield Green, Ripe. Pounds.
Earliana (Cap Rouge)	5	Oct. 11	$1\frac{4}{16}$
Bonny Best (Cap Rouge)	5	" 11	$3\frac{5}{16}$
Rennie's X X X Earliest (Cap Rouge)	5	" 11	$3\frac{1}{4}$
" " "	5	" 11	$2\frac{3}{4}$
Florida Special	5	" 11	$2\frac{1}{8}$
Chalk's Early Jewel (Cap Rouge)	5	" 11	2
Sparks' Earliana (Cap Rouge.)	5	" 11	2
" " (C. E. F.)	5	" 11	$1\frac{7}{8}$
" " (Sunnybrook Strain)	5	" 11	$1\frac{5}{8}$
Chalk's Early Jewel (Cap Rouge)	5	" 17	$1\frac{1}{2}$
Trophy	5	" 11	$1\frac{1}{2}$
Earliest of All	5	" 11	$1\frac{1}{4}$
Bonny Best (Cap Rouge)	5	" 11	1
Chalk's Early Jewel	5	" 11	1
Northern Adirondack Earliana (Cap Rouge)	5	" 11	1
Sparks' Earliana (C. E. F.)	5	" 11	$\frac{3}{4}$
First of All (Cap Rouge)	5	" 11	$\frac{1}{8}$
Matchless	5	" 11	$\frac{1}{4}$
" (Cap Rouge)	5	" 11	$\frac{1}{4}$
Livingston's Globe	5	No fruit formed	

TURNIP.

Variety.	Length of rows.	Ready for use.	Yield in pounds.
Purple Top Milan	30 ft.	July 12	$53\frac{7}{16}$
Early White Flat Strapped	30 ft.	July 15	$51\frac{7}{16}$

FLOWERS.

A great deal of work was done during the year on the ornamental grounds which were laid out under the direction of Mr. F. E. Buck. Over three hundred varieties of annuals and perennials were grown, besides numbers of bulbs, shrubs, and hedges.

HEDGES.

It is important to learn what kinds of plants are most suitable for hedge purposes in the province of Quebec, and basing the kinds to be tested on those which were succeeding best at Ottawa, the following trees and shrubs were planted. Each variety of these was planted in one row fifty feet long, the plants being eighteen inches apart in the rows. The hedges are placed fifteen feet apart:—

Thunberg's Barberry (*Berberis Thunbergii*),
Siberian Pea Tree (*Caragana arborescens*),
Siberian Dogwood (*Cornus alba sibirica*),
Cockspur Thorn (*Cratægus Crus-galli.*)
Irish Juniper (*Juniperus communis fastigiata*),

White Spruce (*Picea alba*).
Norway Spruce (*Picea excelsa.*)
Blue Spruce (*Picea pungens Kosteriana*),
White Pine (*Pinus Strobus*),
Alder Buckthorn (*Rhamnus Frangula*).
Tree Lilac (*Syringa amurensis*),
Josika's Lilac (*Syringa Josikaea*),
American Arbor-Vitæ (*Thuya occidentalis*).

CONIFERÆ.

The following coniferæ were planted in the spring: *Abies concolor,* 2; *Cupressus sphaeroidea ericoides,* 2; *Cupressus pisifera aurea,* 2; *Cupressus pisifera filifera,* 4; *Cupressus pisifera plumosa,* 2; *Juniperus communis fastigiata,* 2; *Larix europaea,* 2; *Picea alba,* 2; *Picea Alcockiana,* 2; *Picea excelsa,* 2; *Picea pungens glauca,* 2; *Pinus Laricio nigricans,* 2; *Pinus montana Mughus,* 2; *Pinus ponderosa,* 2; *Pinus resinosa,* 2; *Pinus Strobus,* 2; *Pinus sylvestris,* 2; *Pseudotsuga Douglasii,* 2; *Thuya occidentalis,* 1; *Thuya occidentalis Elwangeriana,* 2; *Thuya occidentalis Hoveii,* 2; *Thuya occidentalis Wareana,* 2; *Thuya occidentalis compacta,* 2; *Thuya occidentalis Douglas Golden,* 2.

DECIDUOUS TREES AND SHRUBS.

The following were planted in the spring of 1912: *Acer tataricum Ginnala,* 4; *Aesculus Hippocastanum,* 2; *Berberis Thunbergii,* 2; *Caragana arborescens,* 4; *Caragana frutescens macrophylla,* 4; *Caragana grandiflora,* 3; *Catalpa Kaempferi,* 2; *Catalpa speciosa,* 2; *Cornus alba sibirica variegata,* 2; *Elaegnus angustifolia,* 2; *Euonymus europaeus,* 2; *Hydrangea paniculata,* 1; *Hydrangea paniculata grandiflora,* 24; *Lespedeza bicolor,* 2; *Ligustrum amurense,* 2; *Lonicera Alberti,* 2; *Lonicera Morrowi,* 3; *Lonicera tatarica,* 2; *Lonicera tatarica flore rosea,* 3; *Lonicera tatarica grandiflora,* 3; *Lonicera tatarica virginalis alba,* 3; *Neillia opulifolia aurea,* 3; *Philadelphus coronarius,* 2; *Philadelphus coronarius foliis aureis,* 2; *Philadelphus grandiflorus speciosissimus,* 2; *Philadelphus nivalis,* 6; *Philadelphus speciosissimus,* 2; *Potentilla fruticosa,* 1; *Prunus Grayana,* 2; *Pyrus Aucuparia,* 2; *Pyrus angustifolia, fl. pl.,* 2; *Quercus palustris,* 2; *Rhamnus Frangula,* 1; *Ribes aureum,* 2; *Rosa Rugosa,* 2; *Salix rosmarinifolia,* 2; *Sambucus nigra foliis aureis,* 2; *Spiræa callosa,* 3; *Spiræa japonica,* 1; *Spiræa sorbifolia,* 1; *Spiræa Van Houttei,* 25; *Symphoricarpus racemosus,* 2; *Syringa chinensis,* 2; *Syringa japonica,* 2; *Syringa villosa,* 3; *Syringa vulgaris Congo,* 2; *Syringa vulgaris Jacques Calot,* 5; *Syringa vulgaris Léon Simon,* 2; *Syringa vulgaris Ludwig Spath,* 6; *Syringa vulgaris Marc Micheli,* 2; *Syringa vulgaris Michel Buchner,* 6; *Syringa vulgaris Mlle Fernande Viger,* 6; *Viburnum dentatum,* 3; *Viburnum Molle,* 3; *Viburnum Opulus,* 2; *Viburnum Opulus sterile,* 7.

The season was such a bad one, with continual rain until the middle of June followed by a drought which lasted until the beginning of August, that many annuals bloomed very late, whilst others did not bloom at all.

EXPERIMENTAL FARM, BRANDON, MANITOBA.

REPORT OF THE SUPERINTENDENT—W. C. McKILLICAN, B.S.A,

Horticulture has been an important part of the work of the Experimental Farm at Brandon for the past twenty-three years, and during that time much useful information has been published which has assisted settlers in deciding what to plant, how to plant, and how to care for what they are trying to grow. In 1912 many varieties of fruit trees and bushes, ornamental trees and shrubs, vegetables, and herbaceous perennials and annuals were under test, and in the following report an account is given of the behaviour of some of them.

VEGETABLES.

The season was rather an unfavourable one for the vegetable garden. June was the driest in the history of the Farm, and the drought was combined with high temperatures. This interfered with the germination of late-sown seeds, and made it very difficult for newly transplanted plants to live. Following the drought came torrential rains, which washed out some plants and buried others. Finally, a cool, cloudy summer delayed the ripening of tomatoes, melons, and other crops that require much heat. The results obtained are as good as could be expected under the unfavourable weather conditions.

POTATOES.

Twenty-four varieties of potatoes were planted in uniform test rows on May 27, in black loam soil. One variety, Everett, was accidentally prevented from making full development, and is not included in the test. The remaining twenty-three varieties were dug on September 24. The following yields are calculated from the product of a 66-foot row, or one-two hundred and twentieth of an acre, of each variety.

POTATOES—TEST OF VARIETIES.

Name of Variety.	When Matured	Average Size.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
				Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	
Table Talk	Late	Large	Good	715	..	663	40	51	20	Long, white.
Wee McGregor	Medium.	Small	"	594	..	568	20	25	40	Oval, white.
Woodbury's White Rose.	Late	Large	"	579	20	564	40	14	40	Long, white.
Empire State	"	"	"	557	20	531	40	25	40	"
Ashleaf Kidney	"	"	"	542	40	528	..	14	40	"
Reeve's Rose	Medium.	"	"	506	..	498	40	7	20	Pink.
Early Ohio	Early	"	"	535	20	476	40	58	40	"
American Wonder	Late	"	"	480	20	462	..	18	20	Long, white.
Irish Cobbler	Early	Medium	Medium	509	40	458	20	51	20	Round, white.
Early Bovee	"	"	"	498	40	458	20	40	20	Long, pink & white
Late Puritan	Late	Large	Good	466	40	455	40	11	..	Long, white.
Money Maker	"	Medium	"	421	40	388	40	33	..	"
Morgan Seedling	"	Large	"	396	..	385	..	11	..	"
Peacock's Surprise	Medium.	Medium	"	440	..	381	20	58	40	Long, russet.
Early White Prize	Early	Small	"	407	..	352	..	55	..	Long, white.
Rochester Rose	Medium.	"	"	392	20	341	..	51	20	Long, pink.
Manitoba Wonder	"	Medium	Medium	370	20	330	..	40	20	" pink and white
Sabean Elephant	Late	Large	Good	330	..	322	40	7	20	Long, white.
Hamilton's Early	Medium.	Medium	"	344	40	293	20	51	20	Oval, white.
Carman No. 1	"	"	Medium	325	20	281	20	44	..	"
Factor	Late	"	"	229	40	2 5	20	14	40	Long, white.
Gold Coin	"	"	"	231	..	194	20	36	40	Oval, white.
Hard to Beat	"	Small	"	190	40	156	40	34	..	Long, white.

Five Year Averages.

Thirteen of these varieties have been grown for the last five years, and six more have been grown for three years. The following are the average results obtained in these periods:—

Variety.	Average Earliness.	Average Size.	Average Yield per Acre.	
			Bush.	Lb.
Ashleaf Kidney	Late	Large	517	22
Morgan Seedling	Medium	"	459	20
American Wonder	Late	"	455	46
Empire State	Medium	"	449	56
Reeve's Rose	"	Medium	439	38
Late Puritan	Late	Large	438	26
Irish Cobbler	Medium-Early	Medium	435	36
Money Maker	Medium-Late	"	430	06
Early White Prize	Early	Small	429	44
Manitoba Wonder	Medium	Medium	422	24
Carman No. 1.	"	Large	401	26
Rochester Rose	Early	Small	387	34
Gold Coin	Late	Large	355	40
Woodbury's White Rose (average of 3 years)	Medium	Medium	501	03
Early Ohio (average of 3 years)	Early	Large	482	46
Peacock's Surprise (average of 3 years)	Medium	Medium	424	06
Hamilton's Early "	Medium-Early	"	416	53
Factor "	Late	Small	287	26
Hard to Beat "	"	"	233	20

Commercial Fertilizers on Potatoes.

Three kinds of commercial fertilizers were tested separately on potatoes, and a combination of the three was also tried. Acid Phosphate was used as a representative of fertilizers containing phosphorous, muriate of potash was chosen as a typical potash manure, and sulphate of ammonia was used for nitrogen. The plots were 1/30 acre in size. The potatoes were planted on May 27 and dug on September 24.

Fertilizer Used	Yield per Acre.	
	Bush.	Lb.
No fertilizer	441	50
Acid phosphate (600 pounds per acre)	352	00
Muriate of potash (320 pounds per acre)	460	10
Sulphate of ammonia (160 pounds per acre)	485	50
Acid phosphate (600 pounds per acre) Muriate of potash (320 pounds per acre) Sulphate of ammonia (160 pounds per acre)	564	40

Each of these fertilizers costs about $9 or $10 per acre in the quantities used, exclusive of cost of application.

Cooking Test.

A cooking test was made of twenty-two varieties of potatoes. The following were the notes taken on their cooking qualities:—

Variety.	Character of Surface.	Flavor.	Texture.	Dryness.	Remarks.
Table Talk...	Smooth, shallow eyes.....	Good.....	Very good....	Medium dry..	Cooks quickly
Wee McGregor....	" "	Very good	" ...	Dry..........	
Woodbury's White Rose........	" "	"	" ..	"	
Empire State.....	Very smooth, shallow eyes	"	"	Very dry......	
Ashleaf Kidney...	Smooth, shallow eyes......	"	"	Dry..........	
Reeve's Rose.....	Smooth, medium eyes.....	"	"	Medium, varying.......	
Early Ohio	Smooth, deep eyes........	Good.....	Rather coarse	Dry..........	Some red flesh.
American Wonder	Smooth, shallow eyes	Very good	Very good....	Varying......	
Irish Cobbler......	Deep eyes................	Medium..	Medium......	Rather moist..	Slow to cook.
Early Bovee	Rather rough, rather deep eyes...............	Good.....	"	Wet.........	
Late Puritan.....	Smooth..................	"	Good.........	Dry..........	
Money Maker.....	Very smooth, shallow eyes	"	"	Medium......	
Morgan Seedling..	Smooth, medium eyes. ...	Very good	Very good....	Dry..........	
Peacock's Surprise	Very smooth, shallow eyes	"	"	Medium......	
Early White Prize	Medium smooth, medium shallow eyes..........	Good.....	Good.........	"	
Rochester Rose....	Medium smooth...........	Very good	"	"	
Manitoba Wonder	Medium shallow eyes......	Good.....	Medium	Good........	Some red flesh.
Sabean Elephant..	Smooth, shallow eyes.....	Very good	Good.........	"	
Hamilton's Early.	" "	Good.....	"	Rather moist..	
Factor............	Smooth, very shallow eyes	Medium..	Medium.....	Dry..........	Cooks very quickly.
Gold Coin	Smooth, shallow eyes...	Very good	Very good....	Medium dry..	
Hard to Beat......	Very smooth, shallow eyes	Good.....	Medium.....	Dry..........	Cooks quickly, yellowish flesh.

ONIONS.

Five varieties of seed onions and three kinds of sets were planted on April 19 and 20.

Variety.	Date of ripening.	Yield of one 60 foot row.
		lbs.
Dark Red Beauty........	Sept. 16..........	78
Large Red Wethersfield........	" 16.........	75
Ailsa Craig........	" 16.........	56
Danvers Yellow Globe........	" 16.........	48½
Salzer's Wethersfield........	" 16.........	38
Yellow Dutch Sets........	" 9.........	33
Multiplier Sets........	" 20.........	27
White Dutch Sets........	" 9.........	17

BEETS.

Six varieties were sown in uniform test rows.

Variety.	Ready for use.	Yield of 66 foot row.	Remarks.
		lbs.	
Ruby Dulcet	Aug. 12	139	Good shape, large, good quality
Early Blood Red Turnip	Pulled, Sept. 16.	129	Rather coarse.
Meteor	Aug. 12	119½	Good shape uniform size, good quality.
Black Red Ball	Aug. 12	116	Round, medium size, excellent quality.
Egyptian Dark Red	Pulled, Sept. 16.	102½	Rough, coarse, large.
Rennie's Intermediate	Aug. 6	90½	Long but small, good quality.

CARROTS.

Three varieties were sown on May 5 in uniform test rows and were dug on September 18.

Variety.	Yield of 66 foot row.
	lbs.
Half Long Chantenay	69
Improved Nantes	57
French Horn	52

The French Horn carrots were the best quality for table use.

PARSNIP.

One variety of parsnip, the Hollow Crown, was sown on May 16 and dug on September 9. A 66-foot row yielded 75 pounds.

SALSIFY.

One variety of salsify, the Long White, was sown on May 16 and dug on September 9. A 66-foot row yielded 33 pounds.

RADISH.

Two varieties of radish were sown on May 8. The Early Scarlet White Tipped Turnip was ready for use on June 7 and the Forcing Turnip Scarlet on June 10. Both yielded small radishes of good quality.

BEANS.

Seven varieties of beans were sown on May 29.

Variety.	Ready for use.	Height.	Remarks.
		inches.	
Challenge Black Wax	July 25	15	Very good quality.
Wardwell's Kidney Wax	" 30	18	Good quality.
Valentine	Aug. 4	18	Excellent quality.
Stringless Green Pod	" 15	18	
Keeney's Rustless Wax	" 17	18	
Early Refugee	" 19	24	
Refugee or 1000 to 1	" 22	24	

PEAS.

Thirteen varieties of peas were planted. A uniform test was not obtained, as the dry weather in June caused poor germination of the late sown varieties. The Reliance was the variety which produced the finest quality of peas.

CORN.

Five varieties of table corn were planted on May 28.

Variety.	Ready for use.	Cooking Test.	
		Texture.	Flavour.
Extra Early Adams	Aug. 19	Fairly good	Fairly good.
Mammoth White Cory	" 27	Good	Medium, rather flat.
Malakoff	" 31	Good	Very good.
Fordhook's Early	Sept. 3	A little tough	Fair.
Golden Bantam	" 5	Very good	Excellent.

TOMATOES.

Eleven varieties or strains of tomatoes were sown in a hotbed in April, and were planted out in the garden on June 6. Six plants of each kind were planted, three were pruned and three were left unpruned. The yield was as follows:—

Variety.	Yield of 3 plants pruned.		Yield of 3 plants unpruned	
	Ripe.	Green.	Ripe.	Green.
	Lb. oz.	Lb. oz.	Lb. oz.	Lb. oz.
Spark's Earliana (C. E. F. strain No. 12-18)	14 05	23 00	1 03	12 00
Spark's Earliana (C. E. F. strain No. 12-23)	9 00	16 00	1 03	27 09
Rennie's XXX Earliest	3 07	20 00	1 03	11 00
Bonny Best	2 15½	20 00	....	18 00
Spark's Earliana (Burpee)	1 12	25 00	....	36 ..
Spark's Earliana (C. E. F. strain)	1 12	14 00	1 12	16 03
Trophy	1 08	10 08	....	8 06
Livingston Globe	1 00	23 00	....	6 11
Matchless	1 00	3 00	....	6 11
Chalk's Early Jewel	.. 8	13 08	....	17 12
Flori 'a Special	....	14 00	....	3 09
Average of 11 kinds	3 06	16 09	.. 13	14 14

SPINACH.

One variety of spinach, the Victoria, was sown on May 8, it was ready for use on July 19, and went to seed when 12 inches high.

CELERY.

Six varieties of celery were sown in the hotbed on April 11, and were set out on May 27. They were destroyed by a deluge of rain in July which filled the trench with mud; hence no results are available.

PEPPERS.

Three varieties of peppers were grown, but all were destroyed by frost on September 23, without having fruited.

LETTUCE.

Thirteen varieties of lettuce were sown at various dates. Some of the later sown varieties were very badly affected by the June drought, and failed to develop heads.

Variety.	Weight of average head. Lb.	oz.	Remarks.
Cos Trianon	2	5	Medium quality.
All Heart	1	10	
Crisp as Ice	1	9	Good quality.
Giant Crystal Head	1	4	
Iceberg	..	15	Very g od quality.
Unrivalled Summer	..	12	Good quality.
Wheeler's Tom Thumb	..	11	Good quality
Grand Rapids	....	..	Did not develop heads.
Improved Hanson			" "
Rousseau Blond Winter			" "
Dark Green Capucine			" "
Black Seeded Simpson			" "
Red Edged Victoria			Went to seed before it could be used.

The Iceberg is recommended as a very satisfactory variety.

CABBAGE.

Fourteen varieties of cabbage were started in the hotbed on April 17. They were set out during the first week of June.

Variety.	Ready for use.	Weight of Average Head. lb.	oz.
Flat Swedish	October 7	19	04
Improved Amager Danish Roundhead	" 7	15	00
Large Late Flat Drumhead	" 7	14	00
Early Jersey Wakefield	August 2	12	00
Brunswick or Short Stem	October 7	11	00
Danish Summer Ballhead	" 7	10	12
Copenhagen Market	August 12	10	04
Magdeburg	October 7	10	00
Extra Early Midsummer Savoy	" 20	9	00
Small Erfurt	August 10	9	00
Lubeck	October 7	8	00
Winningstadt	" 7	8	00
Early Paris Market	July 23	7	00
Extra Amager Danish Ballhead	October 7	6	12

CAULIFLOWER.

Three varieties of cauliflower were sown in the hotbed on April 20, and set out during the first week of June.

Variety.	Ready for use.	Weight of average head.		Remarks.
		lb.	oz.	
Danish Giant or Dry Weather......	August 30......	9		Very tender, but lacked flavour.
Extra Selected Early Erfurt Dwarf..	" 27 . .	8	4	Very tender, mild, fine.
Early Snowball....................	" 14......	7	8	Very tender, good flavour.

SQUASH AND MARROWS.

Four kinds of squash and three varieties of vegetable marrow were grown this year. They were planted on June 7.

Variety.	Ready for use.	Weight of average specimens.		Total weight from 12 plants.
		lb.	oz.	lb.
Mammoth Whale Squash....................	September 24...	24		223
Hubbard Squash..........................	" 24...	16		198
Summer Crookneck Squash	August 22...	4	2	123
Delicata Squash	" 14...	3	8	104
Long Vegetable Marrow....................	" 20...	16	8	427
Long White Bush Marrow..................	" 16...	11	8	201
Custard Marrow..........................	" 14...	6		55

MELONS.

Two varieties of water melon and one of musk melon were planted but did not fruit on account of the cool, backward season.

SMALL FRUITS.

A new plantation of fruit bushes was set out this season. The old plantation had become unsatisfactory for testing purposes as there were many bushes of old varieties that had shown themselves unsuitable, and either none at all or only single bushes of the most desirable varieties. The following varieties have been set out in the new plantation:—

RED CURRANTS.

Six bushes each of Wilder, Red Cross, Red Grape, Cumberland Red, Cherry, Greenfield Red, Victoria Red, Red Dutch, Pomona, Rankin's Red, Raby Castle, Perfection.

WHITE CURRANTS.

Six bushes each of Large White, White Cherry, White Grape.

BLACK CURRANTS.

Six bushes each of Topsy, Eagle, Success, Climax, Collins Prolific, Victoria, Eclipse, Saunders, Clipper, Buddenborg, Kerry, Magnus.

GOOSEBERRIES.

Eighteen bushes each of Houghton, Downing.

RASPBERRIES.

Twelve bushes of Herbert, six bushes of Sunbeam, twelve bushes of Caroline. six bushes of King, nine bushes of Loudon, seven bushes of Miller. five bushes of Turner.

STRAWBERRIES.

The strawberry crop was rather disappointing this year. The June drought was at its severest just when they should have been bearing. The plantation is getting rather old; this, with the drought, made a light crop.

APPLES.

The apple orchard is, in the opinion of the present Superintendent, very poorly located. It is on a steep southern slope, where the bright sun in March and April causes the sap to flow too early; this is followed by heavy frost, and the trees are injured. Good locations for an apple orchard are scarcely to be found on this Farm, as the light land practically all slopes southward, and the bottom land is too heavy and rich.

It is still impossible to report success with standard apples. One tree, a numbered variety called No. 179, bore some fine, large, red apples of good flavour. Most of the standard apple trees are in an unthrifty condition.

The following varieties of crossbred or crab apples bore fruit: Silvia, Northern Queen, Ruby, Robin, Elsa, Prince, Alberta, Hyslop, Norman, Carleton, No. 171, Eastman, Jewel, Tony, Osman and Eve, and Ostrakoff a Russian variety of apple. Of these, Silvia is the most satisfactory, the tree is vigorous and hardy, the fruit is of good flavour, and is the size of a good crab apple. The fruit is early ripening and does not keep well. Other varieties that did well are: Northern Queen, a small-sized crab, but well flavoured and prolific; Robin, much like Silvia, but not bearing so well, Ruby and Tony. All the cross-bred varieties seem fairly hardy except Pioneer and Lang, which seem more subject to sunscald and blight.

A large number of trees, seedlings of cross-bred apples, are in the orchard. The fruit of most of these is quite inferior. However, two trees, both seedlings of Cluster, bore good crops of apples that compared favourably with the cross-bred apples.

Vacancies in the orchard have been filled up by planting young trees. The following varieties were obtained from A. P. Stevenson, of Dunstan, Man.: Gipsy Girl, Blushed Calville, Kluevskoe, Antonovka, Volga Anis, Anisette, Phillips, Lyman's Crab, Repka Kislaga, Simbirsk, Charlamoff and Hibernal. Trees of the following varieties were received from the Central Experimental Farm, Ottawa: Pioneer, Jewel, Columbia, Prince, Hibernal and Charles.

SEEDLINGS OF STANDARD APPLES.

A new departure in the testing of apple trees has been made this year. Heretofore the trees used have been two or three years old at the time they were received and planted out. They were planted in permanent locations and consequently took a great deal of room. This year, a large number of small seedlings, one year old, were obtained from the Central Experimental Farm and set out in nursery rows. They were planted in rows three feet apart, and are one foot apart in the row. Thus a large number can be tried in a small area. The object is to test the hardiness of the

plants before they are set out in permanent locations. Large numbers are used so that a greater selection is possible. By obtaining younger trees, they will be more thoroughly acclimatized by the time they reach bearing age. The young trees used are seedlings of some of the hardiest standard apples. It is hoped that among the variations that will occur in growing so many seedlings, some trees will combine a greater hardiness than heretofore obtained with fruit of reasonably good size and quality. The following are the seedlings planted in the spring of 1912 and the number alive in the following autumn:—

Variety.	Number planted.	Number alive in autumn.
Anis	458	371
Anisette	195	142
Antonovka	611	479
Beautiful Arcad	483	424
Charlamoff	529	412
Hibernal	48	26
Tetofsky	237	183
Yellow Transparent	381	311
Total	2,942	2,348

This experiment will be continued in 1913 by planting seeds of Charlamoff, Blushed Calville, Repka Kislaga and Hibernal, obtained from apples grown in Manitoba in 1912 by Mr. A. P. Stevenson.

PLUMS.

A good crop of plums was harvested. The trees that are bearing are mostly native Manitoba plum trees. The fruit from these trees varies greatly; from some, it is very inferior; from others, of excellent quality. They vary also in earliness, in size of fruit and in the stage of maturity at which the fruit falls from the trees. Some of the better trees are well worth propagation. They are all quite hardy. Fruit was also borne by some seedlings of the Cheney variety. These plums are later than the native plum, but are larger. They vary in quality; the better ones are very good.

Young trees of the Cheney and Aitkin varieties and some selected plants of the native Manitoba plum were purchased from the Buchanan Nursery at Winnipeg. Also young trees of the following cross-bred varieties, originated by Professor N. E. Hansen of South Dakota: Opata, Hanska, Sapa and Skuya, were purchased. These trees were planted in vacancies in the plum orchard and in locations from which inferior trees were removed.

FLOWERS.

The herbaceous perennials have bloomed profusely as usual. The iris made a splendid display early in the season. The pæonies bloomed abundantly, but the duration of the bloom was shortened by the drought and the heat of the last of June. Perennial larkspur, scarlet lychnis, autumn daisy, columbines, and other perennials did very well. A large number of varieties of roses bloomed.

Most of the annual flowers were started in a hotbed in April and set out early in June. The season was unfavourable, as the June drought was very hard on the

newly transplanted plants, and the cool, wet weather later on delayed blooming. However, even under these disadvantages, a good display was made, which attracted much attention.

A consignment of various kinds of bulbs for interior use in the winter and for early spring bloom in the garden was received from the Dominion Horticulturist. The tulips are the stand-by for the latter purpose; they made an excellent display this past spring.

The bulbs for house use were very satisfactory, and as this method of obtaining bloom in the winter months is considered of special importance the following brief article prepared on this subject is included herewith:—

BULB CULTURE IN THE HOME.

Practically everyone plans to have a showing of flowers during summer months, but why should not the same precautions be taken in preparation for winter, when there is such a dearth of colour?

The practice of raising bulbs, e.g., hyacinths, daffodils, tulips, etc., for winter bloom should be more general. The work involved is comparatively trifling, and the results most gratifying, but, with this, as with many other things, just a little aside from the ordinary routine, people hesitate to make the start. Yet in reality, more time and care is frequently expended in coaxing into bloom a few sickly geraniums than would be necessary to produce a whole windowful of bright, cheery daffodils.

The first requisite, naturally, is a supply of good fresh bulbs, which should be obtainable of any reliable florist. These should be procured early in October, to insure bloom for Christmas, and should be potted in loose, sandy soil, provided with good drainage facilities.

In general, the bulbs should be put in at such a depth that their tops will be just below the surface of the soil, or, as in the case of the daffodils, slightly above it.

The arrangement of the bulbs in planting is a matter for individual taste to settle. One might have a long window box of tulips for example, with red or yellow in the centre, and a border of white; or pots, ranging in size from the four-inch size to those large, shallow fern pots, frequently used for hanging baskets. One precaution should be observed in combining different varieties, and that is, to be sure that those used together will bloom at the same time. A mass of bloom is certainly beautiful, but when one has a limited supply of bulbs to draw from, it is better to prolong the season of bloom, than to produce it all at once. Most bulbs do not object to crowding, in a seven inch pot one can put half a dozen daffodils, or tulips or Roman hyacinths, while fully a dozen and a half of crocus will find plenty of room in the same area. A very little practice will acquaint one with the habits of the different kinds of bulbs, which, once learned, will facilitate pleasing combinations in arrangement.

When the bulbs have been planted, they should be watered and set in a cool cellar, or dark room. This marks the first and most laborious stage of the work; all that then remains to be done, is to see that they are watered occasionally (say once a fortnight, or less frequently according to the dampness of the cellar) and not allowed to freeze.

The difficulty of knowing just when to bring the pots up to the light, may be overcome in this way. After watering the pot, tip it upside down on the hand, allowing the soil to leave the pot, (it will remain intact if carefully handled), and determine the amount of root development. If the pot seems to be full of roots, it is ready for the light, if not, even if the foliage seems well started, leave longer in darkness, as development of foliage cannot be taken as an indication of root growth.

The Dutch hyacinths can be successfully grown in water, but it is wiser to have plenty of stones in the water, that the roots may be less disturbed by handling. In this case, all that is necessary is to replenish the water as required—a small piece of charcoal is a good addition to the water.

With a very small expenditure of time, labour, and expense, there is no reason why anyone should not have continuous bloom from Christmas until May, when outside flowers are in evidence again.

Some of the varieties which might be suggested are:—

Roman hyacinth..	Brought up	December 5.
Paper White narcissus..	"	December 18.
Golden Spur daffodil..	"	December 18.
Sir Watkin daffodil..	"	February 1.
Dutch hyacinths..	"	January 12.
Tulips (single)..	"	December 15.
Crocus..	"	January 10.
Emperor daffodils..	"	February 18.
Empress daffodils..	"	February 18.
Scilla Sibirica..	"	March 10.

These are merely suggestions as to dates for bringing up, the more reliable test will be that of examing the roots, described above, since cellar conditions will vary greatly in different homes.

EXPERIMENTAL FARM, INDIAN HEAD, SASKATCHEWAN

REPORT OF THE SUPERINTENDENT, ANGUS MACKAY.

In 1888, when the Experimental Farm at Indian Head was started, there was practically a bare prairie in that vicinity. Today, the forest plantations and the many species and varieties of ornamental trees and shrubs growing there show that great changes can be made where trees are planted and cared for, even on what was once open prairie. Within the shelter afforded by the windbreaks are grown crab apples, plums, small fruits, vegetables, and many herbaceous perennials and annual flowers. In the following report will be found the results of some of the horticultural experiments conducted during 1912.

VEGETABLES.

Vegetables all did well, with few exceptions. Frost overtook the beans before they were fully matured. Melons were a failure. Tomatoes had to be lifted and put in the hot-house before frost came. Corn, with the exception of the native varieties, did not ripen.

POTATOES.

The crop of potatoes in 1912 was a satisfactory one.

The seed was planted in rows thirty inches apart, and twelve inches apart in the row. The yield was taken from two rows, sixty-six feet long.

POTATOES.—Test of Varieties.

No.	Variety.	Character of Soil.	Date Planted.	Date Lifted.	Growth.	Size.	Yield per Acre.		Form and Colour.
							Bush.	Lb.	
1	American Wonder...	Clay loam	May 20..	Sept. 26..	Medium..	Medium..	376	12	Long, white.
2	Carman, No. 1	"	" 20..	" 26..	Strong ...	Large.....	446	36	Oval, white.
3	Dalmeny Beauty....	"	" 20..	" 26..	" ..	" ..	437	48	" "
4	Wee MacGregor	"	" 20..	" 26..	" ..	" ..	534	36	" "
5	Vick's Extra Early..	"	" 20.	" 26..	" ..	" ..	422	24	" pink and white.
6	Reeve's Rose........	"	" 20..	" 26..	" ..	" ..	433	24	Oval, red.
7	Everett.......	"	" 20..	" 26..	" ..	" ..	550	..	Long, pink.
8	Table Talk..........	"	" 20..	" 26..	" ..	" ..	588	8	Oval, white.
9	Rochester Rose.....	"	" 20 .	" 26..	" ..	" ..	528	..	" red.
10	Money Maker......	"	" 20 .	" 26..	" .	" ..	479	36	Long, white.
11	Hard to Beat.... ...	"	" 20.	" 26..	Medium..	Small.....	211	12	Oval, "
12	Late Puritan........	"	" 20..	" 26..	Strong. ..	Large	511	36	" "
13	Morgan Seedling....	"	" 20..	" 26..	" ..	" ..	495	..	Long, pink.
14	Gold Coin..........	"	" 20.	" 26..	" ..	" .	580	36	Oval, white.
15	Irish Cobbler	"	" 20..	" 26..	" ..	" ..	532	24	Round, "
16	Ashleaf Kidney.....	"	" 20..	" 26..	" ..	" ..	545	36	Oval "
17	Dreer's Standard....	"	" 20..	" 26..	" ..	" ..	536	48	" "
18	Empire State.	"	" 20..	" 26..	" ..	Medium .	536	48	Round, "
19	Factor	"	" 20..	" 26..	" ..	" ..	253	..	Oval, pink.
20	New Queen..	"	" 20..	" 26..	Medium..	" ..	205	42	
21	Houlton Rose.....	"	" 20..	" 26..	Strong. ..	Large	420	12	
22	Early Norther.......	"	" 20..	" 26..	Medium..	Medium..	277	12	
23	Early Hebron,.......	"	" 20..	" 26..	" ..	Small .. .	370	42	

ASPARAGUS.

A good crop was obtained from the old beds of Barr's Mammoth, Barr's Elmira, and Conover's Colossal. In use from May 15 to June 29.

BEANS.

Variety.	Seed from	In Use.	Remarks.
Kidney Rustless Wax	C.E.F.	Aug. 4	Frozen before ripe, Sept. 14.
Wardwell's Kidney Wax	"	July 26	" " "
Valentine	"	" 31	" " "
Early Refugee	"	" 29	" " "
Challenge Black Wax	"	Aug. 4	" " "
Stringless Green Pod	"	July 29	" " "
Refugee or 1,000 to 1	"	Aug. 19	" " "

BEETS.

Sown May 9; pulled September 26.

Variety.	In Use.	Yield per Acre.		Remarks.
		Bush.	Lb.	
Meteor	July 10	1,360	20	Large.
Black Red Ball	" 20	845	20	Small.
Early Blood Red Turnip	" 10	1,295	20	Medium.
Egyptian Dark Red Turnip	" 10	1,198	40	Large
Ruby Dulcet	" 10	1,585	20	"

CAULIFLOWER

Sown in hothouse March 25; set out May 26.

Variety.	In Use.	Av. Weight per head.	Remarks.
		Lb.	
Danish Giant, or Dry Weather	Aug. 15	7	Medium crop.
Early Snowball	" 20	4	" "
Extra Selected Early Erfurt Dwarf	July 31	6	" "
Large Short Stemmed	Aug. 1	8	" "

CELERY.

Sown in hothouse March 25; planted out June 4, in trenches 18 inches deep, with 6 inches of manure in the bottom, and 4 inches of soil on top of the manure. The celery was given several good waterings during the season.

Variety.	Ready for Use.	Weight per doz. heads.	Remarks.
		Lb.	
Paris Golden Yellow	Sept. 13....	13	Good crop.
Giant Pascal	" 13....	17	" "
Rose Ribbed Paris	Aug. 30....	10	" "
French Success	" 30....	16	" "
Noll's Magnificent	" 30....	12	" "
Evans' Triumph	Sept. 13....	16	" "
White Plume	Aug. 27....	10	" "

CARROTS.

Sown May 9; pulled October 19.

Variety.	In Use.	Yield per Acre.		Remarks.
		Bush.	Lb.	
French Horn	July 20....	580		Extra good crop.
Improved Nantes	" 25...	599	20	" " "
Half Long Chantenay	" 25....	792	40	" " "

CUCUMBERS.

Sown in hothouse April 20; set out in garden May 30.

Variety.	In Use.	Ripe.	Length.	Remarks.
			Inches.	
Giant Pera	Aug. 20....	Sept. 15....	9	Good crop.
Peerless White Spine	" 27....	" 20....	7	" "
Cool and Crisp	" 27....	" 22....	7	" "

CORN.

Variety.	Sown.	In Use.	Ripe.	Remarks.
Fordhook Early	May 25....	....	....	Did not mature.
Malakoff	" 25....	....	....	" "
Golden Bantam	" 25....	....	....	" "
White Squaw	" 25....	Aug. 20....	Sept. 15....	Good crop.
Red Squaw	" 25....	" 20....	" 15....	"

CABBAGE.

Sown in hothouse March 25; set out May 26; taken up September 5.

Variety.	In Use.	Average Weight.	Remarks.
		Lb.	
Early Jersey Wakefield	July 24	6	Medium solid heads.
Early Paris Market	" 15	4½	Small "
Large Late Flat Drumhead	Sept. 4	12	Large "
Extra Early Midsummer Savoy	July 24	4	Small "
Fottler's Improved Brunswick	Aug. 14	13	Large "
Lubeck	" 29	10	" "
Magdeburg	" 29	9	Medium "
Small Erfurt	July 30	6	Small "
Winningstadt	Sept. 4	8	Medium "
Danish Delicatesse, Red	" 4	6	Small "
Red Danish Stonehead	" 4	5	" "
Danish Summer Ballhead	Aug. 14	12	Large "
Flat Swedish	" 29	11	" "
Improved Amager Danish Roundhead	Sept. 4	8	Medium "
Extra Amager Danish Ballhead	" 4	7	Small "
Copenhagen Market	Aug. 1	9	Medium "

BRUSSELS SPROUTS.

Sown in hothouse March 25; set out May 26; ready for use September 13. Average weight, 7 pounds.

MUSK MELON.

One variety (Earliest Ripe) was tested. Sown in hothouse April 20, set out in garden May 30. No fruit matured.

ONIONS.

Sown in garden April 19; taken up September 18.

Variety.	Bushels per Acre.		Remarks.
	Bush.	Lb.	
Johnson's Dark Red Beauty	348	..	Good crop.
Salzer's Wethersfield	299	40	Medium crop.
Danver's Yellow Globe	309	20	Good crop.
Large Red Wethersfield	290	..	Medium crop.
Large Silverskin	212	40	" "

GARDEN PEAS.

Variety.	Date Sown.	In Use.	Ripe.	Remarks.
Gregory's Surprise	May 24	July 10	Aug. 19	Medium crop.
Gradus	" 24	" 10	Sept. 2	" "
American Wonder	" 24	" 15	Aug. 19	Large crop.
McLean's Advancer	" 24	" 23	Sept. 2	Medium crop.
Heroine	" 24	Aug. 14	" 10	" "
Stratagem	" 24	" 14	" 10	" "
Telephone	" 24	July 25	" 10	Large "
Thomas Laxton	" 24	" 20	" 2	Medium "
Premium Gem	" 24	" 20	" 2	Large "
Nott's New Perfection	" 24	Aug. 20	" 2	Medium "
Sutton's Excelsior	" 24	July 20	" 2	Small "
Juno	" 24	Aug. 14	" 10	Large "

PARSNIPS.

Sown in garden May 19; taken up October 3.

Variety.	In Use.	Yield per acre.		Remarks.
		Bush.	Lb.	
Hollow Crown	Aug. 28	773	20	Good crop.

PARSLEY.

Sown in garden May 13; in use July 20; pulled October 14. Variety, Double Curled, good crop.

PEPPERS.

Three varieties were tried, Cayenne, Chili, and Early Neapolitan. These were sown in the hothouse March 25; set out in garden June 9. No fruit matured. Several plants of Early Neapolitan were allowed to remain in the hothouse during the summer and these gave a good crop of fruit, which ripened October 15.

RADISH.

Variety.	Sown in garden.	In Use.	Remarks.
Forcing Turnip Scarlet	May 9	June 10	Medium crop.
Extra Early Scarlet White-tipped Turnip	" 9	" 10	"

SQUASH.

Sown in hothouse April 20; transplanted in garden May 30.

Variety.	In Use.	Average weight.	Remarks.
		Lb.	
Summer Crookneck	Aug. 2	3	Good crop.
Delicata	" 15	3	"
Custard Marrow White bush. Scallop	Sept. 6	2	"
Long White Bush Marrow	Aug. 15	8	"
Long Vegetable Marrow	" 15	9	"
White Congo			Did not mature.
Mammoth Whale	Aug. 10	14	Good crop.
Hubbard	" 10	10	"

LETTUCE.

Variety.	Sown in garden.	In Use.	Remarks.
Red Edged Victoria	May 13	July 14	Good crop.
Unrivalled Summer	" 13	" 14	"
Wheeler's Tom Thumb	" 13	" 14	"
Cos Trianon	" 13	" 14	"
All Heart	" 13	" 14	"
Grand Rapids	" 13	" 14	"
Giant Crystal Head	" 13	" 14	"
Black Seeded Simpson	" 13	" 14	"
Crisp As Ice	" 9	" 10	"
Iceberg	" 9	" 10	"
Improved Hanson	" 9	" 10	"
Rousseau Blond Winter	" 9	" 10	"
Dark Green Capucine	" 9	" 10	"

PUMPKIN.

Sown in the hothouse April 20; transplanted in garden May 30.

Variety.	In Use.	Average weight.	Remarks.
		Lb.	
Jumbo	Aug. 15	30	Good crop.
Connecticut Field	" 15	14	"
Mammoth King	" 15	13	"

SALSIFY.

One variety, Long White, was sown in the garden on May 13; ready for use on October 3. Gave a medium crop.

SPINACH.

One variety, Victoria, was sown in the garden May 9; ready for use June 14. Gave a good crop.

EGG PLANT.

One variety, New York Improved, was tested; sown in hothouse April 6; set out in garden June 4. No fruit matured.

Jewel Apple Tree, Experimental Farm, Indian Head, Sask.

Havesting Potatoes on Irrigated Land, Lethbridge, Alberta.

TOMATOES.

Sown in hothouse March 25; transplanted in garden May 26. The yield is the number of pounds of fruit, both green and ripe, taken on September 10 from one plant of each variety set three feet apart.

Variety.	First Ripe.	Yield.	Remarks.
		Lbs.	
Sparks Earliana (Sunnybrook Strain)	Sept. 9..	7	Large fruit.
Chalk's Early Jewel	Aug. 28..	4½	Small "
Bonny Best	Sept. 4..	4	" "
Trophy	" 4..	3	" "
Matchless	" 9..	5	" "
Livingston's Globe	" 10..	5	Large "
Bennie's XXX Earliest	" 10..	5	Small "
Florida Special	Aug. 28..	6	Large "
Sparks Earliana, 12-23, C.E.F	" 28..	4	Medium "
Sparks Earliana, 12-18, C.E.F	Sept. 10..	7	Large "
Sparks Earliana, C.E.F	" 10..	6	" "
Sparks Earliana, I.H	Aug. 30..	8	Medium "

TABLE TURNIPS.

One variety, Early White Flat Strap Leafed, was sown in the garden May 19; ready for use July 12, giving a yield of 986 bushels per acre.

SUMMER SAVORY.

Sown in garden May 9; in use July 14; pulled September 11. Gave a good crop.

SAGE.

Sown in garden May 9; pulled September 11. Gave a good crop.

RHUBARB.

Old beds in use from May 15 up to September 4; made a good growth during the season. The following varieties were grown:—

Myatt Linnæus.
Victoria.
Fottler's Improved.
Royal Linnæus.
Prince Albert.
Scarlet Nonpareil.
Strawberry.

FLOWERS.

The show of flowers last year has seldom been surpassed, both in quality and length of time in bloom. Asters, stocks, verbenas and petunias were never better. Sweet peas were sown in four collections and were remarkable for size and beauty. In perennials, pæonies, tulips, gladioli, dahlias and cannas were extra fine.

ROSES.

Except the single varieties, none of the roses was conspicuous. Nine double varieties bloomed, these being La France, pink; Magna Charta, pink; Mrs. R. G. Sharman Crawford, pink; Frau Karl Druschki, white; Margaret Dickson, white; Ulrich Brunner, Madame Gabriel Luizet, Mrs. John Laing and Captain Hayward, red. The third and last named are the finest.

FLOWERING SHRUBS.

Shrubs were conspicuous from the quantity of bloom. The lilacs, caragana and honeysuckle were extra good in this respect.

ANNUALS.

Variety.	Sown in Hothouse.	Trans-planted in garden.	In Bloom.	
			From	To
Asters, 13 varieties	Mar. 25	May 29	July 29	Sept. 12.
Antirrhinum, 11 varieties	" 26	" 30	" 10	" 20.
Balsam	" 25	" 29	Frozen off	
Carnations	" 26	" 22	No bloom	
Chrysanthemum	" 26	" 30	June 20	Sept. 20
Kochia	" 26	" 29		
Lobelia	" 26	June 4	July 10	Sept. 15.
Nemesia, 9 varieties	April 5	May 31	June 20	" 15.
Nasturtium	March 26	" 29	" 28	" 15.
Phlox Drummondii, 7 varieties	" 26	" 29	" 2	" 15.
Pansy, 5 varieties	" 26	" 30	" 2	Oct. 28.
Petunia, 4 varieties	" 25	" 27	" 26	Sept. 15.
Portulaca	" 25	" 31	July 7	" 15.
Stocks	" 25	" 27	" 28	" 19.
Verbena, 8 varieties	" 25	" 29	" 25	" 19.
Viola, 4 varieties	" 26	" 30	June 20	Oct. 28.

ANNUALS—SOWN IN GARDEN.

Variety.	Sown.	In Bloom.	
		From	To
Brachycome, mixed	May 21	No bloom	
Bachelor's Button	" 21	June 7	Sept. 15.
Calliopsis	" 21	Aug. 15	" 12.
Candytuft, selected	" 31	July 10	" 12.
Celosia, mixed	" 21	Aug. 15	" 15.
Coreopsis	" 21	" 5	" 15.
Dianthus, 8 varieties	" 21	" 10	" 26.
Dimorphotheca, 3 varieties	" 21	July 10	" 12.
Eschscholtzia, 2 varieties	" 21	" 14	" 12.
Gaillardia	" 21	Aug. 5	Sept. 12.
Godetia, dwarf mixed	" 21	" 15	" 19.
Gypsophila	" 21	" 30	" 19.
Larkspur, 3 varieties	" 21	" 15	" 20.
Mignonette, sweet scented	" 21	July 10	" 12.
" Red Victoria	" 21	" 24	" 15.
Nicotiania affinis	" 21	Aug. 12	" 15.
Poppy, 3 varieties	" 21	July 25	" 15.
Papaver	" 21	Aug. 5	" 15.
Salpiglossis, mixed	" 21	" 15	" 15.
Sweet peas	April 18	July 1	" 15.
Scabiosa, 3 varieties	May 21	Aug. 15	" 15.
Salvia	" 21		
Sweet William	" 22		

PERENNIALS.

Variety.	Remarks.	Variety.	Remarks.
Achillea	Good.	Larkspur	Good.
Blue Squills	"	Oriental Poppy	"
Bleeding Heart	"	Paeony, assorted varieties	"
Columbine	"	Phlox (perennial)	"
Comfrey	Medium.	Shasta Daisy	"
Clematis	Good.	African Daisy	"
German Iris	"	Tall White Iris	"
Golden Glow	Medium.	Canterbury Bell	"
Gladioli	Good.	Tulips (17 varieties)	"
Helianthus	"	Dahlia (Prince Imperial)	"
Hemerocallis	"	Dahlia (33 varieties)	"
Iris sibirica	"	Canna, (13 varieties)	"
Japanese Paeonies	"		"

BULBS PLANTED IN FALL OF 1912.

Thirty-five varieties of tulip, narcissus and crocus were received from the Central Experimental Farm, Ottawa, and planted on October 28.

ROSES.

Variety.	In Bloom. From	In Bloom. To	Colour.
La France	July 29	Aug. 4	Pink.
Magna Charta	" 5	July 25	"
Mrs. R. G. Sharman Crawford	" 7	Aug. 7	"
Frau Karl Druschki	" 15	" 11	White.
Margaret Dickson	" 10	" 8	"
Ulrich Brunner	" 8	" 2	Red.
Madam Gabriel Luizet	" 14	" 10	"
Mrs. John Laing	" 24	Sept. 9	"
Captain Hayward	" 6	Aug. 1	"

SMALL FRUITS.

In small fruits, currants and raspberries were much more prolific than for years back. The insect which has destroyed the currants for the last few years was absent from the crop last season. Gooseberries had very little fruit, and strawberries were also a failure.

The following varieties of small fruits are grown on the Farm at present. When picking, a record was kept of the weight of fruit gathered from one of the bushes of each, and the weights are given below. The dates of picking were from July 23 to August 7.

RED CURRANTS.

Variety.	Fruit Picked.	Variety.	Fruit Picked.
	Lb.		Lb.
Benwell	9	Moore's Early	4½
Cherry	16	North Star	2
Cumberland	12	New Red Dutch	12½
Early Scarlet	2	Prince Albert	3½
Fay's Prolific	4½	Red Grape	6½
Fertile d'Angers	6	Raby Castle	6
Greenfield	9½	Rankin's Red	5½
Houghton Castle	1¾	Red Jacket	2
London Red	2	Simcoe King	1¾
Large Red	5	Victoria	13½
La Conde	9	Victoria Red	4
Long Bunch Holland	14	Versaillaise	2¾

WHITE CURRANTS.

Variety.	Fruit Picked.	Variety.	Fruit Picked.
	Lb.		Lb.
Climax	2	White Dutch	3
Frauendorfer White	3½	White Kaiser	2½
Large White	10½	White Cherry	14½
Large White Brandenburg	10	White Pearl	8½
Verrieres White	10½	White Grape	6½
White Imperial	5	Wentworth Leviathan	3¾

BLACK CURRANTS.

Variety.	Fruit Picked.	Variety.	Fruit Picked.
	Lb.		Lb.
Black English	22	Mattie	4
Beauty	20½	Merveille de la Gironde	17
Black Grape	18½	Magnus	12½
Crandall's Missouri	4¾	Ogden	5½
Clipper	3	Ontario	14
Climax	22½	Oxford	4
Dominion	3¾	Perry	2½
Eclipse	6½	Perth	3
Ethel	13½	Stirling	21
Eagle	18½	Stewart	2¾
Ismay's Prolific	2½	Star	4
Kerry	18	Standard	3¾
Lewis	5	Saunders	12
Lee's Prolific	17½	Topsy	20½
Winona	16½		

RASPBERRIES.

Variety.	Remarks.	Variety.	Remarks.
Sunbeam	Large crop.	Herbert	Large crop.
Columbian	Medium "	King	Medium "
Cuthbert	" "	Marlboro	Large "
Cardinal	Small "	Ruby	Medium "
Dr. Reider	Large "	Turner	Large "
Golden Queen	Poor "		

BLACK RASPBERRIES.

Variety.	Remarks.	Variety.	Remarks.
Conrath	Medium crop.	Older	Poor crop.
Hilborn Black Cap	" "	Palmer	No fruit.
Mungers	No fruit.		

List of gooseberries growing in the bush fruit plantation:—

Companion, Cluster, Carrie, Carman, Cox's Late Green, Downing, Edna, Governess, Gibb, Griffin, Houghton's Seedling, Industry, Lady Houghton, Mabel, Merton, Pale Red, Ruth, Rideau, Red Jacket, Ramsay, Richland, Smith's Improved, Saunders, Sussex, Sandow, Silvia, Troy, Vesta, Weir, York.

LARGE FRUITS.

Although crab-apple bloom was abundant, frost killed a large part before the fruit set, and the crop was light. The varieties that fruited are given, with yields.

CROSS-BRED APPLES.

When picking the crop of cross-bred apples a record was kept of the weight of fruit gathered from some of the best trees, and the weights are given below. The date of picking was September 9.

Orchard.	Row.	No.	Name.	Year Planted.	Began Fruiting.	Weight of Fruit, 1912.	Average Diameter.
						Lb.	Ins.
3	2	231	Tony	1904	1909	13	1½
3	2	235	Tony	1904	1909	21	1½
3	2	243	Eve	1904	1910	24	1
3	2	244	Eve	1904	1910	22	1
3	2	245	Aurora	1904	1909	19	1
3	3	250	Progress	1902	1906	11¾	1
3	4	268	Prairie Gem	1902	1907	19	1¼
3	5	286	Aurora	1902	1907	38	1
3	7	325	Charles	1902	1906	14½	1½
4	2	385	Hunter	1903	1907	19	1
4	3	404	Cavan	1901	1905	24½	1¼
4	3	405	Cavan	1901	1904	62½	1¼
4	3	407	Aurora	1901	1905	10½	1
4	3	415	Wealthy x P. baccata	1901	1906	18½	¾
4	4	419	Progress	1903	1907	14	1
4	5	439	Charles	1903	1907	36	1½
4	8	497	Cavan	1903	1908	16	1¼
5	21	800	Sankey	1905	1909	7½	1
6	1	874	Northern Queen	1905	1910	12½	¾
6	2	893	Pioneer	1905	1909	15	1
6	3	911	Eve	1905	1909	16	1¼
6	6	939	Alberta	1905	1910	8	1½
7	3	983	Prince	1908	1912	8	1¼
7	6	1,033	Jewel	1908	1911	8½	1½
7	7	1,056	Jewel	1905	1910	74	1¼
7	8	1,092	Prince	1905	1909	22	1¼
7	9	1,104	Eve	1905	1910	33	1¼
8	3	1,190	Jewel	1908	1911	16	1½

PLUMS.

Wild varieties gave a fair crop but, like the crab-apples, the blossoms were injured by the frost, and only a few varieties bore fruit.

Three cross-bred varieties, Aitkin, Assiniboin, and Owanka, received from Prof. Hansen in 1908, fruited the past season. The trees being small the crop was not heavy but the fruit was large and of good flavour.

APPLE TREES.

Some three thousand seedling apple trees were planted last spring, in nursery rows, and made a strong growth. No doubt many of them will be killed, but it is hoped that some may survive and bear fruit.

FRUIT TREES PLANTED IN 1912.

Hybrid apple trees received from the Central Experimental Farm, Ottawa, and used to fill up the blanks in the different orchards: 50 Charles, 66 Prince, 100 Jewel, 45 Silvia, 5 Columbia, 62 Pioneer.

The following yearling apple seedlings were received from the Central Experimental Farm, Ottawa, and planted in nursery rows: 600 Anis seedlings, 550 Antonovka seedlings, 525 Beautiful Arcad seedlings, 55 Hibernal seedlings, 220 Tetofsky seedlings, 160 Duchess seedlings, 450 Charlamoff seedlings, 350 Yellow Transparent seedlings.

EXPERIMENTAL STATION, ROSTHERN, SASKATCHEWAN

REPORT OF THE SUPERINTENDENT, W. A. MUNRO, B.A., B.S.A.

Although the Experimental Station at Rosthern is comparatively new, already information has been obtained which should prove of value to those living in this part of Saskatchewan, and the experiments conducted in 1912, while not as extensive as it is hoped they will be in the near future, give some indication of what is being done.

VEGETABLES.

As there was no regular gardener at Rosthern in 1912 the results in vegetables and flowers have not been so satisfactory as it is hoped they will be in the future. Then, too, the wind-breaks have not developed sufficiently to afford good protection to flowers and vegetables. There was a small garden in 1912 in an enclosure sheltered by a wind-break that had been established previous to the purchase of the farm by the Government. The contrast of results from the attempt at gardening in this enclosure as compared with a similar attempt in the open was very marked, the garden in the enclosure being quite satisfactory, whereas that in the open was much injured by winds.

The attempt to grow corn, tomatoes, melons, squash and cucumbers did not meet with success, for nothing ripened.

Following are the results of the other vegetables under experiment:—

CABBAGE.

There were under test this year, sixteen varieties of cabbage, with yields as follows:—

—	No. of Heads.	Weight.	Average Weight per Head.
		Lb.	Lb.
Copenhagen Market	20	224	11·2
Improved Danish Roundhead	21	210	10·0
Flat Swedish	25	234	9·3
Small Erfurt	11	95	8·9
Winningstadt	23	192	8·3
Danish Summer Ballhead	23	191	8·3
Magdeburg	19	149	7·8
Lubeck	26	198	7·6
Improved Brunswick	27	205	7·6
Large Flat Drumhead	24	169	7·0
Danish Ballhead	19	134	7·0
Early Jersey Wakefield	24	140	5·8
Early Paris Market	15	64	4·3
Danish Delicatesse Red	29	116	4·0
Extra Early Midsummer Savoy	11	40	3·6
Red Danish Stonehead	22	76	3·4

These were weighed as they were pulled, a number of the outside leaves being left on. The difference in the average weight per head between the large and the small would show still greater if the cabbage had been stripped of all the loose leaves, because the small heads had a larger number of loose leaves than the large heads, some of the largest heads in fact being almost stripped enough to use.

CAULIFLOWERS.

—	No. of Heads.	Weight.	Average Weight per Head.
		Lb.	Lb.
Erfurt Dwarf	14	32¾	2·3
Danish Giant	23	38	1·6
Early Snowball	14	18¼	1·3

CARROTS.

The following weights are, in each case, for a row thirty feet long:—

Half Long Chantenay	51½ lb.
Improved Nantes	46 "
French Horn	44 "

PARSNIPS.

Hollow Crown	71½ lb.

ONIONS.

Large Red Wethersfield	27 lb.
Danver's Yellow Globe	22 "
Salzer's Wethersfield	16 "
Johnson's Dark Red Beauty	9 "

SALSIFY.

Long White (Oyster Plant)	131 lb.

BEETS.

Meteor	21½ lb.
Early Blood Red Turnip	17 "
Ruby Dulcet	15 "
Egyptian Dark Red Turnip	11 "
Black Red Ball	4½ "

POTATOES.

The yields are the largest obtained in four years' experience at this Station. The seed cut to two eyes and, in the case of the varieties, was planted 12 inches apart in the row with rows 30 inches apart. They were planted with a plough to a depth of 4 inches. The yields given are for both 1911 and 1912. The discrepancy in the order of the yields is one of those unexplainable things that are the bane of experimental work. For instance, in last year's yield Empire State was the highest and Morgan's Seedling sixth. This year Empire State comes eleventh and Morgan Seedling first. This explains why the yield from an experiment should not be taken as very reliable until it has been repeated for at least five years. The yields are computed in each case from the weight of one average row of potatoes 78 feet long. The total

weight of potatoes from .54 acre of these mixed varieties yielded 370.17 bushels which works out at the rate of 685·5 bushels per acre.

Variety.	Bush. per Acre. 1912.	1911.
Morgan Seedling	848	475
Dreer's Standard	840	528
Everett	824	497
Money Maker	822	514
Rochester Rose	807	453
Ashleaf Kidney	804	479
Dalmeny Beauty	744	448
Late Puritan	699	431
Reeves' Rose	659	484
Vick's Extra Early	625	431
Empire State	590	585
Irish Cobbler	573	365
Carman No. 1	536	356
Hard to Beat	536	356
American Wonder	349	264
Factor	316	193

Of those varieties that have been tried for the two years the Irish Cobbler is the outstanding potato for quality, but this is the only desirable characteristic it has. It is a comparatively low yielder both years, is round and has very deep eyes. The following four new varieties have not been tried:—

Purple Nuts	856 bushels.
Up-to-date	778 "
Wee MacGregor	774 "
Table Talk	659 "

The above were under test in 1912 for the first time.

As well as the test of varieties, considerable was done this year by way of cultural work. Four plots of six rows each planted on similar ground at different depths; at depths of 2 inches, 4 inches, 6 inches, and one plot to a depth of 4 inches, but the plough was followed by a subsoil attachment which loosened the ground to a still further depth of 4 inches, that is to say, the plot which was subsoiled was planted 4 inches deep but the earth was made loose to a depth of 8 inches. The evidence from this year's experiment goes to show the importance of deep planting. The yield of 565 bushels per acre for that planted at 2 inches deep does not represent the whole yield because, in every case, the sunburned or frozen potatoes have not been harvested and there were many such left on the ground.

4 inches deep, 4 inches subsoil	789 bushels per acre.
6 inches deep	775 "
4 inches deep	659 "
2 inches deep	465 "

A similar experiment was carried on to determine the value of hilling potatoes. The two plots were given the same cultivation until July, when one plot was ridged. A similar experiment conducted in 1909 showed a difference of 50 bushels per acre in favour of level cultivation. This result is quite in accord with similar experiments conducted in Ontario and England. In Ontario it is found that the hilled potatoes give a larger yield than the unhilled in a wet season, but the reverse is the case in a dry season. In England, where the climate is moist, the yield is in favour of the hilled potatoes.

Unhilled	645 bushels per acre.
Hilled	620 "

An experiment was conducted to determine the distance apart to plant potatoes. One plot was planted with the potatoes 12 inches apart in the row and 30 inches between rows, another plot with the potatoes 14 inches apart in the row and 33 inches

between the rows, and another plot 15 inches apart in the row and 36 inches between the rows. In this experiment the yield from one row was greater where the distance apart was greater, but when consideration is given to the area the yield per acre was the reverse.

The following were the results:—

Seed 12 inches apart, rows 30 inches apart..........	657 bushels per acre.
Seed 14 inches apart, rows 33 inches apart..........	609 "
Seed 15 inches apart, rows 36 inches apart..........	570 "

One experiment was conducted to determine the value of the different parts of the potato for seed. One plot was planted with whole tubers. For the other two plots the tuber was divided across the middle and one plot was planted with the seed end of the tuber and the other plot with the stem end. The following are the results:—

Whole tubers..........	867 bushels per acre.
Seed end..........	703 "
Stem end..........	615 "

This is the only experiment in which several varieties were used. All the other experiments were conducted with Irish Cobbler.

One plot of potatoes was planted on land that had been summer-fallowed in 1911 and received a coating of manure at the rate of 12 tons per acre in the autumn of the same year. Another was planted on land that had grown a crop of peas in 1911 which was ploughed under in July of that year. The following are the results:—

Summer-fallow, with manure..........	657 bushels per acre.
Pea ground..........	563 "

FLOWERS.

Heretofore the flower garden has been in exceedingly cramped quarters and the display was unsatisfactory from the standpoint of arrangement, but there was a good opportunity to observe the development of the different varieties; Asters, antirrhinum, candytuft, coreopsis, larkspur, mignonette, nicotiana, phlox, poppy, pansy, petunia, portulaca, stocks, salpiglossis, verbena, dianthus, sweet peas and zinnia. All came to full bloom and when grown in artistic arrangement in a large border will make a splendid showing.

A border was prepared in 1912, twelve feet wide and extending completely around the lawns, to a length of about one-quarter mile. This was ploughed in the autumn of 1912 to a depth of four inches and subsoiled to a further depth of four inches. In this will be planted both perennial and annual herbaceous plants.

In the autumn of 1912 more than three thousand tulip and other bulbs were received direct from Holland. These were planted in well-worked, rich soil to a depth of about five inches, eight inches apart in the rows, and eight inches between rows. The holes for planting the bulbs were made with a blunt spade handle. After planting, a layer of straw was put on the bed, and they were left in this condition until spring. For the past three years, tulips planted in this way have bloomed for from two to three weeks in May, and added very much to the appearance of the surroundings.

BULBS FOR THE HOUSE.

Several hundred bulbs of tulips, narcissi and hyacinths, were potted in November, well watered, and left in a dark, cool cellar until the winter. Beginning about Christmas time these were taken up to a warm room and allowed to bloom. All the varieties of bulbs attempted in this way forced well and came to good bloom, with

the result that they supplied a continuous display of splendid flowers from Christmas until April. The soil for potting was made up of rich, black prairie mould and coarse sand in the proportion of one of each. The condition of the bulbs in the cellar is carefully watched, and as the soil begins to dry they are watered. There is no other method as good of obtaining inexpensive and satisfactory winter-blooming house plants as with bulbs.

FRUITS.

APPLES.

Of about seven hundred apple trees received in 1909, 1910 and 1911, from various sources, nearly three hundred were in good condition in the spring of 1912, and, with the exception of the winter-killing of some of the tips, showed prospects of continued development. Two thousand nine hundred year-old seedlings were planted one foot apart in the spring of 1912. These were seedlings of Anis, Antonovka, Beautiful Arcad, Charlamoff, Duchess, Hibernal, Tetofsky, Yellow Transparent.

In the autumn of 1912, four boxes of apples were received from Mr. A. P. Stevenson, Dunstan, Manitoba, the varieties being Antonovka, Blushed Calville, Charlamoff and Hibernal. The seeds of these were sown and mulched, and the seedlings will be used with the possibility of developing a variety hardy to this district.

A number of varieties of native plums, gooseberries, raspberries, and black, red and white currants have been planted and are all doing well, but have not yet started to bear fruit.

TREES AND SHRUBS.

Toward the end of 1911 forty-one spruce trees varying from 12 to 30 inches in height were secured about seven miles north of Duck lake. The trees were promptly planted, and occasionally watered through the summer. In 1912 forty of these trees were alive and doing well. Early in June, 1912, 157 more trees were secured. Up to the approach of winter only two of these had died and the remainder showed good prospect of continuing to thrive. The success with these native-grown spruce has been much better than that with similar trees obtained from nurseries. There is one great advantage in securing trees locally in this way, that they are planted the day following their being dug, whereas trees received from a nursery are oftentimes more than two weeks out of the ground.

An insect pest was discovered on spruce trees last year, the spruce budworm, which is doing considerable damage throughout the district. It was found that spraying with any of the common insecticides is quite effective, but the spraying is considered to be quite an expensive operation for large ornamental trees.

A quantity of maple, ash and caragana seeds was sown in the spring of 1912 and the seedlings attained good growth during the season. These ought to develop into good plants for transplanting by the spring of 1914.

Plum stones obtained from local orchards and planted in the fall of 1911 did not do so well, but cuttings from Russian poplar obtained locally made growths in some cases of two feet. This supply of nursery stock will constitute the first ornamental material for distribution, and will be ready in the spring of 1914.

HEDGES.

The following twenty-one hedges, each 50 feet in length, with thirty-four plants to the hedge, were started in the spring of 1912. They all made good growth and went into the winter in good condition:—

Salix laurifolia—Laurel-leaved Willow.
Rhamnus catharticus—Buckthorn.
Rhamnus Frangula—Alder Buckthorn.
Elaeagnus angustifolia—Russian Olive.
Fraxinus pennsylvanica lanceolata—Green Ash (Native Ash).
Crataegus Crus-galli—Cockspur Thorn.
Neillia Opulifolia aurea—Golden-leaved Spiraea.
Salix—Siberian Hedge Plant.
Acer tararica Ginnala—Ginnalian Maple.
Syringa vulgaris—Common Lilac.
Caragana arborescens—Sibirian Pea Tree.
Cornus alba sibirica—Siberian Dogwood.
Shepherdia canadensis—Buffalo Berry.
Picea canadensis—Native white Spruce.
Lonicera tatarica grandiflora—Tartarian Honeysuckle.
Syringa Josikaea—Josika's Lilac.
Syringa amurensis—Tree Lilac.
Prunus americana—Native Plum (Brandon).
Caragana frutescens—Caragana.
Acer Negundo—Manitoba Maple.
Corylus rostrata—Hazel (native).

The ornamental border of the driveway from the entrance to the Superintendent's house, which was begun in 1911, was still added to in 1912, and gives good promise of exhibiting results in an artistic arrangement of ornamental shrubs.

EXPERIMENTAL STATION, SCOTT, SASKATCHEWAN.

REPORT OF THE SUPERINTENDENT, R. E. EVEREST, B.S.A.

The Experimental Station at Scott is situated on a bare prairie without a tree in sight, except those which have been planted at the Station. Exposed as it is to the wintry winds, it is not expected that the experiments with some things will be very satisfactory until protection is afforded by the trees and shrubs which have been planted for that purpose. Still, in 1912, some information was obtained which should be useful to settlers coming into this part of Canada, and it is hoped that year by year the results will be increasingly valuable.

VEGETABLES.

EXPERIMENTS WITH POTATOES.

Nineteen varieties of potatoes were planted on the 25th of May in drills thirty inches apart, sets twelve to fourteen inches apart in the drills. After the crop was up the ground was harrowed and frequent cultivation given during the season. The last time through with the single cultivator, the moulds were turned to throw a little earth toward the rows. The potatoes were taken up on the 8th of October, and were a very satisfactory crop for size and quality, and in the majority of varieties the total yield was good.

POTATOES—Test of Varieties.

Number.	Name of Variety.	Date of Planting.	Date of Lifting.	Size.	Yield per Acre.		Form and Colour.
					Bush.	Lb.	
1	Morgan Seedling..........	May 25..	Oct. 8..	Large....	513	42	Long and white.
2	Ashleaf Kidney	" 25..	" 8..	"	438	50	Kidney shape, white.
3	Wee McGregor	" 25..	" 8..	"	409	12	Oval, smooth, white.
4	Table Talk................	" 25..	" 8..	"	372	54	Oval, white.
5	Money Maker..............	" 25..	" 8 .	Medium..	372	52	Long, white.
6	Gold Coin..............	" 25..	" 8..	" ..	369	36	Oval, white.
7	Rochester Rose	" 25..	" 8..	" ..	359	42	Long, red.
8	Carman No. 1............	" 25..	" 8..	" ..	331	6	Oval, white.
9	Empire State..........	" 25..	" 8..	Large	330	..	"
10	Deer's Standard	" 25..	" 8..	" ...	315	42	"
11	Everett.	" 25..	" 8..	Medium..	299	12	Oval, red.
12	Late Puritan, ...	" 25..	" 8..	Large....	298	6	Long, white.
13	Dalmeny Beauty	" 25..	" 8..	Medium..	293	42	Oval, white.
14	Irish Cobbler	" 25..	" 8..	" ..	292	36	Round, white.
15	Vick's Extra Early...	" 25..	" 8..	Large ...	203	30	Long, pink.
16	Reeves' Rose.........	" 25..	" 8..	Medium..	194	42	Long, red.
17	Hard to Beat..............	" 25..	" 8..	" ..	160	36	Long, white.
18	American Wonder..........	" 25..	" 8..	Large.. .	144	6	Round, white with pink eye.
19	Factor	" 25..	" 8..	Medium..	103	24	Oval, white.

VEGETABLE TESTS.

The results in vegetable tests, though not large, are encouraging indications as to what may be accomplished in the growth of garden produce. A number of the summer vegetables came in quickly and gave an abundant growth of good table quality.

BEANS.

Sown in garden May 31. Did not ripen.

Variety.	In use.	Remarks.
Kenney's Rustless Wax	Aug. 25	A good green crop.
Wardwell's Kidney Wax	" 14	" "
Valentine	" 25	" "
Early Refugee	" 25	" "
Stringless Green Pod	" 25	" "
Refugee or 1,000 to 1	Sept. 1	" "
Challenge Black Wax, (C.E.F)	Aug. 17	" "

BEETS.

Sown April 24; pulled October 15.

Variety.	In use.	Yield per Acre.	
		Bush.	Lb.
Ruby Dulcet	July 15	929	36
Egyptian Dark Red Turnip	" 15	464	48
Early Blood Red Turnip	" 15	309	52
Meteor	" 15	271	8
Black Red Ball			

CABBAGE.

Sown in hotbed in April 12; set out in open June 1; taken up October 15. Owing to the work of worms in early part of the season, resettings were necessary at different times, which made the growth very irregular, and the yield light.

Variety.	In use.	Average Weight.	Remarks.
		Lb.	
Danish Summer Ballhead	Aug. 15	5	Solid.
Improved Amager Danish Roundhead	" 15	$3\frac{2}{3}$	"
Large Late Flat Drumhead	" 15	$3\frac{2}{7}$	"
Copenhagen Market	" 15	3	"
Early Jersey Wakefield	" 1	3	"
Flat Swedish	" 15	3	"
Fottler's Improved Brunswick or Short Stem	" 15	3	"
Winningstadt	" 15	3	"
Magdeburg	" 15	$2\frac{3}{11}$	Soft.
Early Paris Market	" 1	$2\frac{1}{3}$	Medium solid.
Small Erfurt	" 15	$2\frac{1}{3}$	Soft.
Extra Early Midsummer Savoy	" 1	2	Medium solid.
Lubeck	" 15	2	Soft.
Extra Amager Danish Ballhead			Failure.
Red Danish Stonehead			"

LETTUCE.

Sown in garden May 15; in use July 27.

Name of Variety.	Remarks.
Dark Green Capucine	Fair heads.
Rousseau Blond Winter	"
Imp. Hanson	Good heads.
Iceberg	"
Crisp as Ice	Fair heads.
Giant Crystal Head	Large heads.
All Heart	Small firm heads.
Cos Trianon	Large heads.
Wheeler's Tom Thumb	Small good heads.
Red Edged Victoria	Good heads.
Unrivalled Summer	"
Black Seeded Simpson	Fair heads.
Grand Rapids	Good heads.

GARDEN PEAS.

Sown April 24.

Name of Variety.	In use.	Remarks
Heroine	July 16	Splendid crop.
Premium Gem	" 16	"
Juno	" 25	"
Stratagem	" 1	"
American Wonder	" 14	"
McLean's Advancer	" 16	"
Telephone	" 1	"
Gradus	" 4	"
Gregory's Surprise	" 4	"
Sutton's Excelsior	" 18	"
Thos. Laxton	" 16	"

CAULIFLOWER.

Three varieties of cauliflower were sown in the hotbed on April 12, and were set out in the open June 1. Of these, the Danish Giant or Dry Weather, was the only one to produce heads, which, on the 15th of August were ready for use.

CELERY.

Three varieties of celery were sown in the hotbed on the 15th of April, and were set in the open June 15. Of these, the variety Giant Pascal gave the best return, and on the 15th of October was in use.

CARROTS.

Three varieties of carrots were sown in the open on May the 29th, and were pulled on the 15th of October. The average yield was 329 bushels and 14 lbs. per acre.

CUCUMBERS.

A good return was obtained from cucumber vines, which were allowed to occupy the hotbed frame after the transplanting of other varieties had been completed. A number of large cucumbers, as well as a quantity of small picklers, were produced.

ONIONS.

Four varieties of onions were sown in the garden, April 17. The seed germinated well, but perished immediately on account of dry weather.

PARSNIPS.

One variety of parsnips was sown in the open the 29th of May, and were dug on October the 15th. The name of the variety was Hollow Crown, and the yield was 193 bushels and 40 pounds per acre.

RADISH.

Two varieties of radish were sown in the open on the 15th of May, and were in use June the 27th. Both varieties gave a favourable return.

TURNIPS.

One variety of turnip was sown in the open on the 24th of April, and was pulled on October the 15th. The roots were ready for use on the 15th of July, and gave a yield of 745 bushels and 37 pounds per acre.

Vegetables that did not mature and number of varieties of which seed was sown:—

Tomatoes—Eleven varieties.
Peppers—Three varieties.
Egg Plant—One variety.
Squash—Seven varieties.
Corn—Three varieties.
Water Melons—Two varieties.

THE FLOWER BORDER.

A flower border, 12 feet in width and 550 feet in length, running north and south on the inner border of the lawn, was an outstanding feature. Commencing the 24th of June, and continuing until the first serious frost, the 15th of September, bloom was to be seen; at times throughout August the entire border was a mass of variegated beauty. Seed was sown in hotbed on April 15 and 16. Transplanting into open took place from June 7 to 11.

Manitoba Maple Seedlings. Seed sown May 25. Photo taken Aug. 20, 1912.

Name.	No. of Varieties.	In Bloom.	
		From	To
Antirrhinum	9	Aug. 1	Oct. 1.
*Artemisia	1		
Aster	13	Aug. 10	Sept. 15.
Balsam	1	" 1	Oct. 1.
Calliopsis	1	July 5	Sept. 15.
Candytuft	1	June 25	Oct. 1.
Celosia	3	Aug. 15	" 1.
*Chrysanthemum	1		
Dianthus	7	July 20	Oct. 1.
Dimorphotheca	1	June 26	Sept. 15.
*Eschscholtzia	2		
Gaillardia	1	Aug. 15	Oct. 1.
Lobelia	2	Sept. 1	Sept. 15.
Mignonette	1	June 27	" 15.
Nemesia	8	" 24	" 15.
Nicotiana	1	Aug. 5	" 15.
Pansies	5	July 20	Oct. 1.
Petunia	4	" 10	" 1.
Phlox	7	" 20	" 1.
Poppies	3	Aug. 1	Sept. 15.
Portulaca	1	July 15	" 15.
Salpiglossis	1	" 20	" 15.
Sweet Peas	55	Aug. 15	" 15.
*Sweet Sultan	1		
Tagetes	1	July 25	Oct. 1.
Verbena	8	" 20	" 1.
Viola	4	" 15	" 1.
Zinnia	1	" 25	Sept. 15.
Perennial—			
Sweet William	1	June 25	Aug. 25.

* Did not bloom.

FRUIT TREES.

Eleven more varieties of apples were added to the orchard list. In addition to this tree planting, over 2,800 seedlings were placed in the nursery row, and in autumn seeds from four varieties of apples ripened in Manitoba were planted in a protected frame. In these ways a strong effort is being made toward the production of hardy apple stock suited to this part of Saskatchewan.

TREES AND SHRUBS.

At the rear of the lawn an arboretum was started, comprising trees of known hardihood, and many that have not been proved in this district. Three hundred and ninety trees, including one hundred and seventy-two varieties, were planted in the arboretum. Some results as to their suitability will soon be available.

EXPERIMENTAL STATION, LETHBRIDGE, ALBERTA.

REPORT OF THE SUPERINTENDENT, W. H. FAIRFIELD, M.S.

The Lethbridge Experimental Station is the only one of the prairie Farms or Stations where part of the land is irrigated. The climate of southern Alberta is dry and many things succeed much better when the land is irrigated than they otherwise would do. Apple trees are succeeding better at Lethbridge than at any other of the prairie Farms or Stations. Small fruits succeed well, and vegetables, especially when irrigated, succeed admirably. Owing to the dry winds, the protection of trees is greatly needed, and the native cottonwood, known as the Alberta cottonwood, has proved one of the best trees for wind-breaks.

THE SEASON.

The season of 1912 resembled that of 1911 in that the rainfall during the early part was deficient, while during the latter part the usual amount was received.

The results of the crops on the Station during the summer of 1912 have been interesting, although, in many instances, somewhat disappointing. The season opened up in a most propitious manner. Work on the land began on March 28, and the first seeding was done on April 1, although it would have been possible to have begin a little earlier. The soil was left moist from the fall of 1911, and the land was in excellent shape to work in the spring, consequently all crops planted were put in under exceedingly favourable conditions where land had been prepared the summer or fall previous. However, the rainfall during April, May and until the end of June in the immediate vicinity of Lethbridge was extremely light. Germination on land that was not so treated was not good.

The rainfall was very light indeed until the last few days in June; from then on, during July, August and September, it was above normal. On account of this light rainfall during the first part of the growing season all early-sown crops suffered acutely. Crops that looked extremely promising early in the season gave but low yields. Late-sown crops, on the other hand, did much better providing they ripened before the frost.

The yields of all the crops on the non-irrigated portion of the Station were rather low, with the exception of peas and such late-growing crops as turnips, potatoes, etc.

On the irrigated portion of the Station, however, where water was applied in June, and in some cases even in May, the yields were very much more satisfactory.

VEGETABLES.

EXPERIMENTS WITH POTATOES (NON-IRRIGATED.)

Seventeen varieties were planted on summer-fallowed land, in rows thirty inches apart, on May 13. The potatoes for planting were cut in pieces with two or three eyes in each, although medium rather than large-sized potatoes were selected, so as to avoid cutting as much as possible. They were dug September 27, and the yield was computed from one hundred and fortieth of an acre.

Potatoes.—Test of varieties (non-irrigated) sown, May 15; harvested, September 27; size of plot, 1/140 acre

No.	Variety.	Total Yield per Acre.		Yield per Acre, Marketable.		Yield per Acre, Unmarketable.		Form and Colour.
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	
1	Dalmeny Beauty	403	40	345	20	58	20	Round, white.
2	Gold Coin	394	20	375	40	18	40	Round, oval, white.
3	Ashleaf Kidney	385	..	354	40	30	20	Oval, white.
4	American Wonder	375	40	336	..	39	40	Oval, white.
5	Late Puritan	354	40	322	..	32	40	Oval, white.
6	Carman No. 1	354	40	315	..	39	40	Oval, white.
7	Empire State	354	40	308	..	46	40	Oval, white.
8	Dreer's Standard	343	..	319	40	23	20	Round, white.
9	Factor	338	20	308	..	30	20	White.
10	Morgan Seedling	338	20	303	20	35	..	Irregular, pink.
11	Vick's Extra Early	305	40	277	40	28	..	Flat, white.
12	Everett	303	20	266	..	37	20	Oval, pink.
13	Money Maker	301	..	268	20	32	40	Flat, oval, white.
14	Irish Cobbler	296	20	259	..	37	20	Round, white.
15	Reeves' Rose	263	40	219	20	44	20	Oval, pink.
16	Rochester Rose	217	..	198	20	18	40	Oval, pink.
17	Hard to Beat	191	20	168	..	23	20	White.

Potatoes from irrigated land vs. seed from non-irrigated land.

In 1911 an experiment was started to see whether seed potatoes grown on the dry land were better than seed grown on irrigated land, and the experiment was again carried on this season.

Three rows, each 126 feet long, rows thirty inches apart, were planted with Ashleaf Kidney potatoes grown on non-irrigated land the previous season. Alongside, three more rows the same length were planted with seed grown on irrigated land the season previous.

—	Total Yield per Acre.		Yield per Acre, Marketable.		Average Yield for Two Years.	
	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
Seed from irrigated land	328	54	279	4	373	52
Seed from non-irrigated land	308	12	277	32	360	25

Potatoes planted at different distances apart.

Potatoes were planted in rows 2½, 3, 3½ and 4 feet apart and the sets were put on one-half the rows two feet apart and on the other half one foot apart. The following results were obtained:—

POTATOES planted at Different Distances Apart (Non-Irrigated).

Distance apart of rows.	Sets put two feet apart.					Sets put one foot apart.				
	Amount of Seed used per Acre.	Yield in 1912 per Acre.		Average Yield per Acre for Three Years.		Amount of Seed used per Acre.	Yield in 1912 per Acre.		Average Yield per Acre for Three Years.	
Feet.	Lb.	Bush.	Lb.	Bush.	Lb.	Lb.	Bush.	Lb.	Bush.	Lb.
2½	598	296	43	269	33	1,104	343	28	307	43
3	598	286	5	234	31	1,104	322	34	274	21
3½	598	206	2	193	32	1,104	237	40	271	28
4	644	153	7	164	31	1,104	240	..	233	5

EXPERIMENTS WITH POTATOES (IRRIGATED).

Test of Varieties.

Eighteen varieties of potatoes were planted on land on which grain had been grown last year. They were planted on May 14 in rows thirty inches apart, the sets being placed one foot apart in the rows. The potatoes for planting were cut into pieces with two or three eyes in each, although medium rather than large-sized potatoes were selected so as to avoid cutting as much as possible. The crop was irrigated twice, on July 31 and August 7. They were dug September 28, and the yield was computed from one hundredth of an acre.

POTATOES.—Test of Varieties (Irrigated), Lethbridge, 1912; Sown May 14; Dug September 28.

No.	Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.		Form and Colour.
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	
1	Table Talk	720	..	666	40	53	20	Oval, white.
2	Wee McGregor	680	..	646	40	33	20	Oval, white.
3	Dreer's Standard	655	..	628	20	26	40	Round, white.
4	Dalmeny Beauty	643	20	616	40	26	40	Round, white.
5	Factor	626	40	606	40	20	..	Oval, white.
6	American Wonder	620	..	603	20	16	40	Oval, white.
7	Reeve's Rose	591	40	558	20	33	20	Oval, pink.
8	Gold Coin	576	40	556	40	20	..	Oval, white.
9	Morgan Seedling	561	40	538	20	23	20	Irregular, pink.
10	Money Maker	551	40	525	..	26	40	Flat, white.
11	Late Puritan	530	..	520	..	10	..	Oval, white.
12	Carman No. 1	526	40	503	20	23	20	Oval, white.
13	Empire State	523	20	508	20	15	..	Oval, white.
14	Ashleaf Kidney	516	40	498	20	18	20	Oval, white.
15	Irish Cobbler	501	40	468	20	33	20	Round, white.
16	Everett	468	20	450	..	18	20	Oval, pink.
17	Vick's Extra Early	435	..	410	..	25	..	Flat, pink and white.
18	Rochester Rose	393	20	378	20	15	..	Oval, pink.

Potatoes from New York (Irrigated).

Five varieties of early potatoes were received from Honeoye Falls, New York, U.S.A., to be tested out, and they were sown on land that had been in hoed crops the year previous. They received two irrigations on July 28 and August 8. They were

dug September 23. The plots varied in size, but in most cases the yield was computed from one row 115·5 feet long.

POTATOES from New York.—Test of Varieties (Irrigated), Lethbridge, 1912, Planted June 6; Dug September 23.

No.	Variety.	Total Yield per Acre.		Yield per Acre, Marketable.		Yield per Acre, Unmarketable.		Form and Colour.
		Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	
1	Early Northern...... ...	518	26	498	18	20	8	Oval, pink.
2	Irish Cobbler.	517	11	...	....	....	....	Oval, white.
3	Houlton Rose...........	359	53	342	16	17	37	Oval, pink.
4	Early Hebron...........	258	27	246	50	11	37	Oval.
5	New Queen.............	185	37	....	.....	......	.....	Oval, pink.

POTATOES from Irrigated Land vs. Seed from Non-irrigated Land.

—	Total Yield per Acre.		Yield per Acre, Marketable.		Average Yield for 2 Years.	
	Bush.	Lb.	Bush.	Lb.	Bush.	Lb.
Seed from non-irrigated land........................	511	13	477	57	544	33
Seed from irrigated land...	514	15	494	53	486	3

FRUITS.

The various kinds of fruit obtained on the Station during the past season consisted of red, white and black currants, raspberries and strawberries.

There were blooms on half a dozen or so apple trees, but the heavy frost on June 6 destroyed all the apples that were set, with the exception of a single specimen of Florence crab, which matured, so this crab has the distinction of being the first apple tree to produce fruit on the Lethbridge Station.

CURRANTS.

Of the small fruits there is probably none hardier or easier to raise than currants, red, white, and black. A shelter from the west wind of some kind should be provided. In the following tables are given the results of the different kinds of currants we have under test. There are three plants of each variety planted 6 feet apart each way. The yields given are not at all large, particularly in the case with the black currants, but the plantation has not been set out long and this is the first year that they have produced fruit. To give some idea of the yield it might be interesting to point out that the New Red Dutch, which produced 13 pounds 9 ounces on the three plants, yielded at the rate of 5,465 pounds per acre.

Red Currants.—Test of Varieties.

White Currants (Irrigated).—Test of Varieties.

Variety.	Date of first ripe fruit.	Date of last picking.	Actual yield.		Size of berry.
			Lb.	oz.	
New Red Dutch	July 1	July 30	13	9	Large.
Large Red	" 1	" 24	11	14	Medium.
Red English	" 1	" 24	10	12	"
Cumberland	" 1	" 31	10	6	"
Victoria Red	" 1	" 31	9	13¼	"
La Conde	" 1	" 31	9	3½	"
Moore's Seedling	" 17	" 24	9	..	Large.
Greenfield	" 1	" 31	8	13	Medium.
Pomona	" 1	" 31	8	..	"
Red Dutch	" 1	" 30	7	13½	"
Raby Castle	" 1	" 31	7	10	"
Prince Albert	" 12	" 31	7	..	Large.
Red Grape	" 1	" 31	5	11	"
Wilder	" 1	" 31	5	2	"
Frauendorfer	" 1	" 24	4	2	"
Long Bunch Holland	" 1	" 31	2	12½	Medium.
Rankin's Red	" 1	" 31	2	1½	Large.
Champagne	" 16	" 24	1	6	"
Fay's Prolific	" 1	" 24	1	3	"

White Currants (Irrigated).—Test of Varieties.

Variety.	Date of first ripe fruit.	Date of last picking.	Actual yield.		Size of berry.
			Lb.	Oz.	
White Cherry	July 1	July 31	13	2	Medium.
White Brandenburg	" 1	" 31	12	15	Large.
White Kaiser	" 20	" 23	9	10	"
White Pearl	" 1	" 31	9	..	Medium.
Large White	" 1	" 23	7	5	"
White Grape	" 1	" 31	5	11	Large.
Verrieres White	" 1	" 24	5	8	"
Climax	" 1	" 23	2	14	Medium.
Wentworth Leviathan	" 1	" 10	2	2	"

Black Currants (Irrigated).—Test of Varieties.

Variety.	Date of first ripe fruit.	Date of last picking.	Actual yield.		Size of berry.
			lb.	oz.	
Beauty	July 1	July 31	4	10½	Medium.
Eagle	" 1	" 23	3	½	Large.
Climax	" 1	" 23	2	3½	Medium.
Ontario	" 1	" 23	2	3	"
Saunders	" 1	" 23	1	15	"
Bang Up	" 1	" 23	1	10½	Small.
Norton	" 1	" 23	1	2½	Medium.
Monarch	" 1	" 23		14	Large.
Magnus	" 1	" 23		12½	"
Winona	" 1	" 10		8	"
Eclipse	" 1	" 23		7½	"
Topsy	" 1	" 23		6½	"
Merveille de la Gironde	" 1	" 10		5	Medium.

RASPBERRIES.

These did not yield quite so well this year as they did in 1911. The stand is not perfect in all cases so that the yields reported are not comparable and so do not do justice to the different varieties. The plantation was arranged for twenty plants of each variety, the rows 7 feet apart and two rows of each variety with ten plants in each row. In very few cases were there enough plants to fill the space and although, as has been said, the comparative yields are not reliable they are of sufficient interest to warrant reporting. The yield of the Marlboro computed per acre would be 3,068 boxes.

Test of Varieties.—(Irrigated).

Variety.	Date of first ripe fruit.	Date of last picking.	Actual yield.	Size of berry.
			pts.	
Marlboro	July 5	Aug. 22	29½	Large.
Early King	" 5	" 15	27½	Medium.
Loudon	" 18	" 30	24½	Large.
Sunbeam	" 13	" 30	18	Medium
Herbert	" 27	" 19	9¾	Small.
Cuthbert	" 13	" 12	9¼	Medium.
Sarah	" 27	" 19	5	Small.
Ruby	" 5	July 20	1½	Medium.

In the growing of raspberries here it has been found that it is absolutely necessary to bend the canes down and cover them with earth in the fall before heavy frosts set in and then uncover them in the spring about the time the buds start to swell. To cover with earth it is necessary that the rows be put 7 or 8 feet apart so that there is room for a ditch from which to get the material. Covering with straw or manure has not been satisfactory, because we do not get enough snow to protect the canes during the winter when they are dried out with our drying winds.

STRAWBERRIES (IRRIGATED).

The strawberry crop from a commercial standpoint was a failure this year. The writer has raised strawberries in the Lethbridge district in his own garden for the last twelve years and this is the first year that the blooms have been seriously affected with frost. The low temperature that did the damage was on June 6. It destroyed all the fruit that was set at that time and injured the blooms, the result being that the fruit which followed was inferior and mis-shaped. Considerable fruit was obtained, of course, but it was small and irregular in shape.

A new plantation was set out consisting of twenty-eight varieties. An excellent stand was obtained and the prospects are bright for a good crop this coming season.

Strawberries are an easy fruit to grow in southern Alberta. Heavy mulching in the winter appears to be necessary; for this purpose, old straw or hay in which the weed seeds have been destroyed by sprouting is the best. If there are any spots on the patch from which this material blows off during the winter they should be re-covered. Barnyard manure or litter does not do well as a substitute for the straw or hay as it is apt to settle down too closely and sometimes smothers the plants. The period of blossoming can be retarded a week or ten days by leaving the mulch on as long as it appears to be safe. By so doing a damaging frost may be avoided.

VEGETABLES (IRRIGATED).

Between the slow and poor germination caused by the dry weather, and attacks by cutworms, the vegetable garden did not give the results that might otherwise have been the case.

BEANS.

Seven varieties were tested. They were planted May 16. A good crop was produced but none was matured at the time of killing frost.

Name.	Date first ready for use for string beans.
Refugee or 1,000 to 1	
Challenge Black Wax	
Early Refugee	
Valentine	August 18
Stringless Green Pod	" 4
Wardwell's Kidney Wax	" 4
Keeney's Rustless Wax	" 8

BEETS.

Three varieties, Meteor, Early Blood Red Turnip and Ruby Dulcet, were planted April 10. The first of these ready for use was the Meteor on July 20. Only a poor stand was obtained owing to the dry weather and the cutworms.

CABBAGE.

Sixteen varieties were tested. The seed was sown in the hotbed April 16. The plants were set out in the garden May 30. Two rows, each 30 feet long; 30 plants, 24 inches apart in the rows; rows, 30 inches apart, were planted of each variety. The first variety that was ready for use was the Early Paris Market on July 27.

Name.	Yield in pounds.
Winningstadt	110
Fottler's Improved Brunswick	240
Extra Early Midsummer Savoy	105
Lubeck	240
Magdeburg	177
Danish Summer Ballhead	150
Extra Amager Danish Ballhead	209
Copenhagen Market	150
Improved Amager Danish Roundhead	325
Small Erfurt	190
Flat Swedish	109
Large Late Flat Drumhead	200
Early Paris Market	243
Red Danish Stone Head	150
Danish Delicatesse Red	100
Early Jersey Wakefield	195

CAULIFLOWER.

Three varieties, Early Dwarf Erfurt, Danish Giant and Early Snowball, were tested. The seed was sown in the hotbed April 16, and the plants were set out May 30. Some plants in each variety were ready for use August 1. One head of the Early Dwarf Erfurt weighed 20 pounds

CARROTS.

Three varieties were planted April 10, but a poor stand was obtained.

Name.	Date ready for use.
French Horn	August 16.
Half Long Chantenay	" 12.
Improved Nantes	" 20.

CELERY.

The following six varieties were tested: Noll's Magnificent, French Success, Rose Ribbed Paris, Giant Pascal, Evans Triumph and Paris Golden Yellow. The seed was sown in the hotbed March 23. They all gave quite satisfactory results.

CORN.

Five varieties of corn were tested, Fordhook Early, Golden Bantam, Malakoff, Squaw and an unnamed variety of sweet corn. They were planted May 17. The first three varieties did not mature roasting ears before frost. The Squaw ripened practically all the ears, while the last variety, which was of excellent quality, partially ripened an occasional ear.

CUCUMBER.

Three varieties were tested. Seeds were planted of each in pots on April 16, in the hotbeds, and were set out in the garden June 22, with the following results:—

Name.	Date ready for use.
Peerless White Spine	August 29.
Giant Pera	September 6.
Cool and Crisp	" 6.

Seeds of each of these varieties were planted in the open May 14, but they germinated very slowly and poorly, so were too late to produce anything.

LETTUCE.

Thirteen varieties were planted on April 9. The stand obtained was very uneven, owing to poor germination on account of the dry weather. The first varieties ready for use were the All Heart and the Crisp As Ice, on June 2.

MUSK MELON.

One variety, Early Ripe, was planted, but none of the crop matured before frost.

WATERMELONS.

Two early varieties were tested, but neither matured melons before frost.

ONIONS.

The following varieties of onions were planted April 19; they germinated slowly on account of the dry weather, and did not mature before frost: Salzer's

Wethersfield, Johnson's Dark Red Beauty, Large Red Wethersfield and Danver's Yellow Globe.

PARSLEY.

Double Curled was planted in the garden April 9, and was ready for use June 10.

PARSNIP.

Hollow Crown was planted April 10, and 112 pounds was produced from 30 feet of the row.

PEPPER.

Two varieties of peppers were planted, Chili and Cayenne, in the hotbed March 23, and put out June 21, but were frosted before they matured.

PEAS.

Eleven varieties were planted on April 10. A fairly good stand was obtained. One row 30 feet long was planted of each variety. The rows were 3 feet apart.

Name.	Date First Ready for use.	Total Yield (not shelled). Gallons.
Heroine	July 15	5
Sutton's Excelsior	" 2	7
Telephone	" 5	3¼
Stratagem	" 20	5½
Juno	" 16	5¼
Gradus	June 27	4¾
Thomas Laxton	" 27	3½
Gregory's Surprise	" 27	1½
McLean's Advancer	" 28	1½
Premium Gem	" 28	1
American Wonder	" 28	2

RADISH.

Two varieties, Forcing Turnip Scarlet and Extra Early Scarlet White Tipped, were tested. They were planted in the garden April 9, and were both ready for use May 20.

SALSIFY.

Long White was planted April 17, but only small to medium sized roots were developed.

SPINACH.

One variety, Victoria, was planted April 16, and was ready for use June 19.

EGG PLANT.

One variety, New York Improved, was planted in the hotbed March 23, and was put out in the open June 21, but was frosted before it had matured.

SQUASH.

The following varieties were planted May 13, but were frosted before any of the crop was thoroughly matured; Hubbard, Delicata, Summer Crookneck, Long Vegetable Marrow, Long White Bush Marrow, Custard Marrow, White Bush Scallop, and Mammoth Whale.

TOMATOES.

Eleven varieties were tested but very little fruit was ripened, as a killng frost came on the morning of the 15th of September.

Name.	Date first fruit ripened.
Trophy	September 11.
Florida Special	" 11.
Chalk's Early Jewel	" 8.
Matchless	" 11.
Bonny Best	" 8.
Rennies' XXX Earliest	" 11.
Livingston's Globe	" 11.
Sparks Earliana (Sunnybrook strain)	" 8.
Sparks Earliana (C.E.F. 12/18)	" 11.
Sparks Earliana (C.E.F. 12/23)	" 8.
Sparks Earliana (C.E.F. most productive and uniform)	None ripened before frost

TURNIP.

Early White Flat Strap Leaf was planted April 9, and was ready for use June 24.

FLOWERS.

The bulbs, the first of all flowers, did extremely well. The crocus, scilla and chianodoxa started to bloom from April 20 to 22, and were in full bloom by the 25th to the 27th. The earlier varieties of tulips started to bloom May 7. All the varieties of tulips tested, some nineteen in all, wintered well, and produced large, well-shaped flowers. Where the beds were sheltered somewhat from the strong west winds, the stems were much longer and the blooms were more nearly perfect.

The annuals did not do as well as usual. But few of the varieties produced blooms when the seed was planted in the open. This was due to the fact of the slow germination caused by the dry weather. The plants grown in the hotbeds, and transplanted bloomed, but the relatively cool weather during the latter part of July and August was not conducive to a very luxuriant growth.

The perennials, such as the pæonies, irises, phlox, etc., as usual, made the most satisfactory display of all.

A number of roses were successfully flowered.

EXPERIMENTAL STATION, LACOMBE, ALBERTA.

REPORT OF THE SUPERINTENDENT, G. H. HUTTON, B.S.A.

At this Station the conditions are quite different from those at any of the other prairie Farms or Stations. The elevation is high, the season is fairly moist, and the nights are usually quite cool in the growing season.

Woody plants do not mature as well here as in places where the elevation is lower and the season drier. The tree fruits are not succeeding very well as yet, although, when better protection is afforded, it is hoped they will do better. Small fruits succeed well, and many kinds of vegetables also. The climate is particularly favourable for most annual flowers, which bloom very profusely here, as they do in most places on the prairies.

The following report will give some idea of some of the things which were under test in 1912, and the results obtained.

VEGETABLES.

POTATOES.

Twenty-eight varieties of potatoes were planted in 1912, on land ploughed out of sod in August of 1911, and fall worked. The seed was planted on May 21, in rows two and one-half feet apart; with cuttings, one to two eyes to the cutting, twelve to fourteen inches apart in the row. Shallow cultivation was practised throughout the season. The potatoes were dug on September 23. There was no rot apparent.

Potatoes.—Test of Varieties.

Name of Variety.	Planted	Dug.	Average Size.	Total Yield per Acre.		Total Yield, Marketable.		Total Yield, Unmarketable.		Form and Colour.
				Bush.	Lb.	Bush.	Lb.	Bush.	Lb.	
Rochester Rose....	May 21	Sept. 23	Medium	407	00	335	47	71	13	Pink, long.
Wee McGregor....	″ 21	″ 23	Large...	400	24	370	22	30	2	White, smooth, oval.
Houlton Rose......	June 4.	″ 23	Medium	396	00	344	31	51	29	Red, smooth, long.
Ashleaf Kidney ...	May 21	″ 23	Large...	393	48	354	35	39	23	Pink, oval.
Early Norther.....	June 4	″ 23	″ ...	389	24	350	28	38	56	Red, fairly smooth, long.
Early Hebron	″ 4	″ 23	Medium	382	48	325	33	57	15	Pink, ″ ″
Epicure	May 21	″ 23	″	369	36	295	41	73	55	Deep eyes, red round,
Carman No. 1	″ 21	″ 23	Large...	358	36	322	44	35	52	White, oval. [little flat.
Late Puritan	″ 21	″ 23	″ ...	356	24	347	29	8	55	″
Empire State.. ...	″ 21	″ 23	″ ...	344	18	335	42	8	36	″
Morgan Seedling...	″ 21	″ 23	″ ...	338	48	313	23	25	25	Pink, long.
Table Talk.	″ 21	″ 23	Medium	330	00	252	27	77	33	White, oval.
Dreer's Standard..	″ 21	″ 23	″	317	21	238	1	79	20	″
Irish Cobbler (U. S. seed).........	June 4	″ 23	Small ..	310	12	228	00	82	12	White, round.
Gold Coin.........	May 21	″ 23	Medium	302	30	264	41	37	49	White, oval.
Everett	″ 21	″ 23	″	293	9	234	31	58	38	Red, oval.
Reeves' Rose ...	″ 21	″ 23	″	292	36	225	18	67	18	″
American Wonder.	″ 21	″ 23	″	284	21	213	15	71	6	White, oval.
King Edward VII	″ 21	″ 23	Small ..	281	36	183	2	98	34	Round, pink, quite deep
Money Maker.....	″ 21	″ 23	″ ...	264	00	163	41	100	19	White, long. [eyes.
Factor	″ 21	″ 23	Large...	236	30	195	7	41	23	Round, white.
Irish Cobbler (Home grown seed).....	″ 21	″ 23	″ ...	231	00	190	35	40	25	White, round.
Hard-to-Beat......	″ 21	″ 23	Small ..	191	34	110	3	81	21	Flat, white.
Longworthy.......	″ 21	″ 23	Large...	189	12	156	5	33	7	White, irregular.
Vick's Extra Early.	″ 21	″ 23	Small ..	162	48	113	58	48	50	White, oval.
Dalmeny Beauty...	″ 21	″ 23	″ ...	130	21	87	59	42	22	White, long.
New Queen..	June 4	″ 23	″ ...	115	30	82	00	33	30	

BEANS.

Beans were planted on May 20, in rows thirty inches apart and two inches in the rows. Plants were up on June 9 and commenced to bloom on July 15. Valentine and Wardwell's Kidney Wax took first and second place respectively, as regards yield, while Keeney's Rustless Wax led as to quality, as shown by the following table:—

Variety.	Height.	In use.	Yield per acre.		Quality.
	Inches.		Bus.	Lb.	
Keeney's Rustless Wax	33	Aug. 21	23	36	Extra fine on Aug. 26.
Wardwell's Kidney Wax	16	" 10	68	58	Good on Aug. 11.
Valentine	16	" 21	72	......	Poor.
Early Refugee	17	" 24	58	5	
Challenge Black Wax 1912	13	" 7	62	19	Very good on Aug. 12.
Stringless Green Pod	16	" 22	34	......	
Refugee or 1000 to 1	......	No Crop.	......	......	

Wardell's Kidney Wax, Valentine and Challenge Black Wax, were all more or less troubled with anthracnose.

BEETS.

Beets were sown on April 30, five varieties being tested, as shown by the following table:—

Variety.	In use.	Yield per acre.	
		Bush.	Lb.
Meteor	Aug. 12	145	72
Ruby Dulcet	" 12	348	29
Black-Red Ball	" 12	145	12
Early Blood-Red Turnip	" 15	396	53
Egyptian Dark-Red Turnip	" 6	300	5

BRUSSELS SPROUTS.

Seed was sown on April 15 in the frame, but did not do well enough to make it worth while transplanting. Seed was re-sown on May 8 and the plants were transplanted on June 25, but the crop was ultimately a complete failure.

CABBAGE.

Seed was sown on April 15, pricked out on May 24 and planted in the field on June 14. The following varieties were tested and the crop was harvested on October 21:—

Variety.	In use.		Average weight per head.
			Lb.
Early Jersey Wakefield	Aug.	23	5
Early Paris Market	"	10	4
Large Late Flat Drumhead	Oct.	1	6
Extra Early Midsummer Savoy	Aug.	10	3
Fottler's Improved Brunswick or Short Stem	Sept.	15	5½
Lubeck	"	12	5½
Magdeburg	Oct.	2	5½
Small Erfurt	Sept.	10	4
Winningstadt	"	13	5
Danish Delicatesse (Red)	Oct.	21	4
Red Danish Stonehead	"	21	3
Danish Summer Ballhead	Sept.	10	7
Flat Swedish	"	9	7
Improved Amager Danish Roundhead	Oct,	21	4½
Extra Amager Danish Ballhead	"	21	5½

CAULIFLOWER.

No crop was harvested, as all the plants were destroyed by the cabbage maggot.

CUCUMBERS.

Three varieties, Giant Pera, Peerless White Spine, and Cool and Crisp, were tried but no fruit set.

LETTUCE.

Thirteen varieties of lettuce were planted, all of which grew vigorously. The varieties excelling as to table quality were Improved Hanson and Black Seeded Simpson for curled-leaf sorts, and Cos Trianon and Capucine for smooth-leaf sorts. The curled-leaf varieties were found to be better than the smooth-leaf as a class.

Variety.	Ready to Use.	Quality.
Red Edged Victoria	....	Ran to seed, no good heads.
Unrivalled Summer	July 22	Fair.
Wheeler's Tom Thumb	" 13	Good, curled, tender.
Cos Trianon	" 26	Best of smooth leaf varieties.
All Heart	" 13	Splendid, curled and tasty.
Grand Rapids	" 24	Splendid quality.
Giant Crystal Head	" 23	Very good quality.
Black Seeded Simpson	" 25	Splendid quality.
Crisp as Ice	" 13	On a par with Black Seeded.
Iceberg	" 15	Fair.
Improved Hanson	" 13	Best of curled leaf varieties.
Rousseau Blond Winter	....	No good heads, ran to seed.
Dark Green Capucine	" 23	One of the best of smooth sorts.

CARROTS.

Seed was sown on April 30, thinned out on July 17, and dug on October 18. Seed was sown in rows thirty inches apart and plants were thinned to one and one-half inches in the rows.

Variety.	In Use.	Yield per Acre.	
		Bush.	Lb.
French Horn	August 6	667	50
Improved Nantes	" 10	475	59
Half Long Chantenay	" 15	290	24

CELERY.

Seed was sown in the frame April 10 and transplanted July 6 into trenches. The varieties grown are shown in the following table. The crop was taken up October 26.

Variety.	Number Heads Weighed.	Average Weight.	Quality.
		Lb.	
Paris Golden Yellow	25	16	
Giant Pascal	27	43	Extra good, good size, tender and tasty.
Rose Ribbed Paris	28	25	
French's Success	28	37	
Noll's Magnificent	28	34	A good variety.
Evans' Triumph	30	37	

SWEET CORN.

Four varieties of sweet corn were planted on May 6. The following table gives the results:—

Variety.	Tassels Formed.	Yield for Twenty Hills.
Malakoff	July 30	
Fordhook Early	Aug 7	
Golden Bantam	" 5	
Squaw	July 14	Ten cobs.

ONIONS.

Four varieties of onions were sown on April 17 and harvested October 11, Danvers Yellow Globe giving the largest yield per acre and being the nearest ripe at time of digging.

Variety.	Date Sown.	Date Harvested.	Yield per Acre.	
			Bush.	Lb.
Dark Red Beauty	April 17	Oct. 11	423	30
Salzer's Wethersfield	" 17	" 11	746	34
Danver's Yellow Globe	" 17	" 11	1,127	43
Large Red Wethersfield	" 17	" 11	960	59

PARSNIPS.

Seed of the Hollow Crown parsnip was sown April 30, in rows 30 inches apart, and thinned June 3 to 2 inches in the rows. Crop was dug October 18 and yielded at the rate of 493 bushels 41 pounds to the acre.

PARSLEY.

Double Curled Parsley was sown on April 30 and grew well, attaining a height of 11 inches and being ready for use on July 30.

PEAS.

Seed was sown in rows three feet apart and 1 inch apart in the rows, on May 8, of the following varieties:—

Variety.	Height.		In Use.	Yield per Acre.		Quality.
	Ft.	In.		Bush.	Lb.	
Gregory's Surprise	3	1	July 14	148	14	On July 17, sweet, good quality.
Gradus	5	6	" 20	177	14	On Aug. 8, splendid flavour.
American Wonder	2	4	" 22	158	19	On Aug. 6, fair.
McLean's Advancer	3	0	" 27	179	29	
Heroine	3	7	Aug. 10	76	38	Aug. 24, excellent.
Stratagem	3	4	" 10	29	15	
Telephone	6	0	July 31	156	48	
Thomas Laxton	3	7	" 22	112	56	One of the best tested.
Premium Gem	2	10	" 17	166	53	July 18, very sweet.
Sutton's Excelsior	2	11	" 24	103	52	
Juno	3	9	Aug. 10	160	50	

RADISHES.

Seed was planted on May 8 and July 11, respectively. Varieties used were: Forcing Turnip Scarlet and Early Scarlet White Tipped Turnip. A very good crop was obtained of each variety from the first sowing, but the second was totally destroyed by the maggot.

SQUASH.

Seed was planted on May 4 and May 20, respectively, in hills, nine feet apart each way. No results were obtained from the first planting, but the following table shows the results of the second:—

Variety.	Ready to Use.	Date of Blooming.	Yield per Acre.		
			Tons.	Lb.	Oz.
Summer Crookneck	....	Aug. 7	..	106	4
White Bush Scallop (Custard Marrow)	....	" 7	..	100	11
Long Vegetable Marrow, harvested on Sept. 16	Sept. 12	" 8	3	1,787	
White Bush Marrow, harvested on Sept. 16	Aug. 24	July 19	3	1,160	

TOMATOES.

Seed of eleven varieties were sown in the hotbed on April 10 and were transplanted June 15 to the open field. Eight varieties fruited this year, as against two

last year, which is encouraging. Varieties fruiting were, in the order of productive ability: Sparks Earliana 12-18, Sparks Earliana (Sunnybrook strain), Sparks Earliana 12-23, Bonny Best, Chalk's Early Jewel, Trophy, Sparks Earliana (C.E.F. strain), and Rennie's XXX Earliest.

TURNIPS.

One variety, Early White Flat Strap Leaf, was sown on April 30 and was ready for use June 28. Plants and rows 15 inches apart and 2 inches in the rows, yielded per acre, when dug on October 18, 2,981 bushels 26 pounds. The table quality of these turnips in the early part of the season was fairly good.

SALSIFY.

Long White Salsify was sown April 30 and was dug on October 18, yielding 145 bushels 12 pounds per acre.

FLOWER GARDEN.

The following varieties of annuals were sown in the hotbed on the 10th of April, and set out in the open on the 20th of May.

Variety.	Bloomed from date.	Bloomed to date.
Asters, 13 varieties	August 4	Severe frost.
Antirrhinum, 11 varieties	July 2	October 15
Balsam	" 18	August 30
Brachycome	" 16	September 23
Candytuft	" 17	October 17
Coreopsis	August 9	September 23
Dimorphotheca aurantiaca	" 16	October 17
Eschscholtzia, 2 varieties	June 20	September 23
Lobelia Erinus	July 20	" 23
Larkspur, 3 varieties	August 20	October 17
Mignonette	June 28	" 17
Nicotiana affinis	July 28	" 23
Nemesia, 8 varieties	June 25	September 23
Phlox Drummondii, 7 varieties	July 15	" 23
Poppy, 3 varieties	" 6	November 17
Pansy, 5 varieties	" 18	" 17
Petunia, 3 varieties	June 6	September 23
Portulaca, 2 varieties	July 30	" 23
Stocks	" 3	November 17
Sweet Sultan	August 16	September 23
Scabiosa, 3 varieties	July 2	November 17
Salpiglossis, 2 varieties	August 10	September 23
Verbena, 8 varieties	" 2	" 23
Violas, 4 varieties	July 10	November 17
Artemisia saccorum viridis	Height 65 inches	
Calliopsis	August 3	September 23
Chrysanthemum, 2 varieties	" 10	" 17
Dianthus, 8 varieties	" 20	November 17
Gaillardia	July 29	September 23
Linaria	June 29	November 30
Papaver Danebrog	July 19	September 23
Tagetes	" 28	" 23
Zinnia	August 9	August 30

TULIPS.

Variety.	Commenced to bloom.	Variety.	Commenced to bloom.
Artus	May 17	Vermilion Brilliant	May 14
Chrysolora (single)	" 16	Couronne d'Or (double)	" 16
Cottage Maid	" 19	Imperator Rubrorum	" 17
Duchesse de Parma	" 18	Murillo	" 20
Joost van Vondel (red)	" 15	Darwin (late single)	June 6
Joost van Vondel (white)	" 16	Gesneriana Spathulata	" 5
Keizerskroon	" 16	Isabella	" 1
La Reine	" 19	La Candeur	" 3
Pottebakker (scarlet)	" 15	La Merveille	" 7
" (white)	" 14	Picotee	" 7
Proserpine	" 19	Yellow Rose	" 6

DAFFODILS.

Variety.	Commenced to bloom.	Variety.	Commenced to bloom.
Barri Conspicuus (single)	June 1.	Incomparabilis Sir Watkin	" 28.
Bicolor Empress	May 30.	Poeticus	No bloom.
" Victoria	" 30.	" Ornatus	"
Emperor	" 25.	Princeps	May 25.
Glen Spur	" 28.	Iris Anglica	No bloom.
Incomparabilis Cynosure	" 29.	" Hispanica	July 20.
" Figaro	" 28.		

CROCUS.

Mixed varieties. Bloomed May 4.

SCILLA SIBIRICA.

Mixed varieties. Bloomed May 8

CHIANODOXA LUCILIAE.

Mixed varieties. Weak growth, no bloom.

SWEET PEAS.

Fifty-five varieties of sweet peas were sown April 19. The first to bloom was Helen Grosvenor. All varieties bloomed profusely until well into August. Soil and climate are well adapted to the production of bloom of superior merit.

SMALL FRUITS.

While black, red and white currants fruited freely, it is perhaps well to defer another year the publication of the table of standing of the varieties being tested.

Of the varieties of black currants under test, Beauty led with a yield of 13,209 pounds to the acre, while Bang Up, though not a heavy yielder, produced the choicest fruit.

Among the red currants, Albert led with a yield of 9,995 pounds to the acre, while the fruit was large and of excellent quality.

As regards white currants, White Grape was first with a yield of 5,193 pounds to the acre, while Large White Brandenburg produced the best fruit.

Gooseberries did not fruit at all.

Of the raspberries, the red sorts alone fruited; Sunbeam and Early King producing the most fruit, while Herbert gave berries of splendid quality and size.

The order of merit according to yield of strawberries was Warfield, Wm. Belt and Tennessee.

ORCHARD.

The apple trees came through the winter fairly well. Winter-killing was in evidence with many of the standard varieties. The cross-bred and crab-apples, as a class, are hardy, while such standard varieties as Hibernal, Charlamoff and Antonovka, give promise of success. Fruit formed on three trees of Eve, a cross-bred variety, but was blown off before mature.

Two thousand nine hundred and ten yearling seedlings were set out in the spring of 1912. These were grown from seed of the following varieties: Anis, Antonovka, Beautiful Arcad, Hibernal, Tetofsky, Duchess, Charlamoff, and Yellow Transparent. A large proportion of the trees secured by the growing of these seedlings should be hardy, while a fair proportion of these hardy trees should produce a good quality of fruit.

Mr. A. P. Stevenson, of Dunstan, Manitoba, supplied this Station with the following varieties of apples, from which seed was taken: Blushed Calville, Antonovka, Charlamoff and Hibernal. These seeds were planted in a frame in October and trees will be produced from this northern-grown stock and handled in the same manner as outlined above. This system affords the quickest solution to the problem of securing hardy trees for this country, and varieties of satisfactory quality.

TREE PLANTING.

The principal tree planting of the year consisted in planting groups of trees and shrubs in the grounds, between the Calgary and Edmonton trail and the Superintendent's residence. It is proposed to complete this work in the spring of 1913, and when done, the grounds will be most attractive. The testing of these varieties of trees and shrubs will afford visitors a good opportunity of comparing varieties and making selections for their own grounds.

LISTS OF BEST VARIETIES OF FRUITS, VEGETABLES, USEFUL AND ORNAMENTAL TREES AND SHRUBS, HERBACEOUS PERENNIALS, CLIMBERS, AND ANNUALS FOR THE PRAIRIE PROVINCES.

So much money is lost by settlers in the Prairie Provinces from buying plants which are unsuitable, that it has been thought desirable to publish a list of those recommended for planting. There is a great difference in the hardiness of plants. Many trees and shrubs which succeed in eastern Canada will not succeed on the prairies. This is particularly true of varieties of fruits, but it is also true in regard to other trees as well. It is important in the case of ornamental trees or trees for forest belts or wind-breaks to obtain trees grown from northern stock. In the case of those marked 'native' in the following list it is very desirable to obtain trees

grown from native stock, as the same species from the southern part of their range would not prove hardy in many cases.

FRUITS RECOMMENDED FOR PRAIRIE PROVINCES.

Apples, in the Most Favourable Situations.—Blushed Calville, Hibernal, Anisette, Duchess, Charlamoff, Antonovka, Patten's Greening, Lowland Raspberry, Beautiful Arcad.

Crab-apples.—Transcendent, Virginia, Hyslop, Florence.

Saunders' Hybrid Apples.—Jewel, Charles, Silvia, Prince, Tony, Robin, and Elsa. These are about the size of other named crab apples, but hardier.

Plums.—Cheney, Aitkin, Odegard, Assiniboine, and best early seedlings of the native plum of Manitoba, which are to be preferred above all others if earliest and best are obtained. In southern Manitoba, and possibly in very favoured locations in other provinces, the Sand and Compass cherries, which are more like plums than cherries, will succeed. There are a number of promising varieties among Hansen's hybrid plums, including Etopa, Hanska, Opata, Kaga, Owanka, and Sapa.

Currants, Red.—Raby Castle, Stewarts, Red Dutch.

Currants, White.—White Grape, White Dutch.

Currants, Black.—Beauty, Naples, Lee's Prolific, Saunders, Victoria.

Gooseberries.—Houghton.

Raspberries, Red.—King, Loudon, Turner, Sunbeam.

Raspberries, Purple.—Columbian.

Raspberries, Black.—Older. The black raspberries are not very satisfactory.

Raspberries should be covered with soil in winter in many places.

Strawberries.—Senator Dunlap, Beder Wood, Crescent, Lovett, Enhance, and Pocomoke. The Senator Dunlap has proved the most satisfactory for general planting. Strawberries need the protection of a straw mulch in winter.

VEGETABLES RECOMMENDED FOR THE PRAIRIE PROVINCES.

Asparagus.—Conover's Colossal, Palmetto, Argenteuil.

Beans.—Round Pod Kidney Wax, Wardwell's Kidney Wax, among yellow-podded or wax, bush beans; and Stringless Green Pod, Early Red Valentine and Early Refugee, among green-podded varieties.

Beets.—Meteor, Early Model, Blood Red Ball, Egyptian, Eclipse.

Cabbage.—Paris Market (extra early); Early Jersey Wakefield, and Copenhagen Market (early), Danish Ballhead and Drumhead Savoy (late) and Red Dutch (red).

Cauliflowers.—Early Dwarf Erfurt and Early Snowball.

Carrots.—Early Scarlet Horn, for early; and Chantenay for main crop.

Celery.—White Plume (the earliest) and Golden Self Blanching (Paris Golden Yellow).

Corn.—Squaw (flint), Early Adams (flint), Early Malakoff (sweet), Golden Bantam (sweet).

Cucumbers.—Peerless White Spine or White Spine and Davis Perfect.

Lettuce.—Grand Rapids (early curled); Iceberg, Giant Crystal Head, Crisp as Ice, and Improved Hanson (curled cabbage); Trianon and Paris are two of the best Cos varieties. Iceberg is one of the best for summer use.

Melons, Musk.—Hackensack and Emerald Gem, under specially favourable circumstances.

Onions.—Early Flat Red, Large Red Wethersfield, and Yellow Globe Danvers. Barletta, White Queen and White Pearl are other early small white varieties, all much alike.

Parsley.—Double Curled.

Peas—Gregory's Surprise, Thos. Laxton, Gradus, American Wonder, Nott's Excelsior, Sutton's Early Giant (early); Sutton's Excelsior, Premium Gem (second early); Reliance, McLean's Advancer, Heroine, Stratagem (medium to late); Telephone, Champion of England and Quite Content are three fine, tall varieties.

Potatoes, early.—Early Ohio, Rochester Rose, Reeves' Rose (pink), Bovee (pink and white). The Early Ohio is not as productive as some, but is very early and dry. Irish Cobbler and Early White Prize (white). *Main Crop.*—Table Talk, Gold Coin, Carman No. 1, Wee McGregor (white), Ashleaf Kidney, Empire State.

Radishes, Scarlet.—White Tipped Turnip, Rosy Gem, French Breakfast, Icicle.

Rhubarb.—Victoria, Linnæus, Strawberry.

Squash.—Summer—Long White Bush, White Bush Scallop, Summer Crook Neck. Winter—Hubbard.

Tomatoes.—Sparks' Earliana; the best strains of this variety are the most reliable, such as North Adirondack and Sunnybrook. Other good varieties not quite as early are: Chalk's Early Jewel, and Bonny Best.

Turnips—Early.—Extra Early Milan.

Turnips—Swedes.—Champion Purple Top, Skirving's Improved.

TREES AND SHRUBS RECOMMENDED FOR THE PRAIRIE PROVINCES.

Deciduous. For Forest Plantation and Windbreak.

Box Elder or Manitoba maple (native), *Acer Negundo*; Green Ash (native), *Fraxinus pennsylvanica lanceolata;* American Elm (native), *Ulmus americana;* Paper or Canoe birch (native), *Betula papyrifera;* Cottonwood (native Alberta), *Populus deltoidea;* Balsam Poplar (native), *Populus balsamifera;* Mossy Cup or Burr oak (native), *Quercus macrocarpa,* for southern Manitoba, especially; Hackberry or Nettle Tree (native), *Celtis occidentalis;* Russian poplar, *Populus petrowskyana;* Laurel-leaved willow, *Salix pentandra,* (*S. laurifolia*); Voronesh or Golden Willow, *Salix Voronesh;* Sharp-leaved willow, *Salix daphnoides acutifolia;* Basswood (native), *Tilia americana,* for southern Manitoba, mainly; Silver or Soft maple (native), *Acer saccharinum* (*dasycarpum*), for southern Manitoba, mainly.

Evergreens and Conifers

White spruce (native), *Picea canadensis* (*alba*); Black spruce (native), *Picea mariana;* Tamarack (native), *Larix laricina;* Lodgepole pine (native), *Pinus contorta Murrayana;* Riga pine, *Pinus sylvestris rigaensis;* and the Scotch pine, *Pinus sylvestris,* which is not quite so hardy; Jack pine (native), *Pinus Banksiana;* Colorado or Rocky Mountain Blue spruce, *Picea pungens.*

Ornamental Trees and Shrubs.

All of the above trees are ornamental, but in addition there are:

Deciduous Trees.—American Mountain ash, *Pyrus americana;* Ginnalian maple, *Acer tataricum Ginnala;* Cut-leaved birch, *Betula alba laciniata pendula;* Canada plum, *Prunus nigra;* American plum, *Prunus americana;* Siberian crab-apple, *Pyrus baccata;* Pin cherry, *Prunus pennsylvanica.*

Evergreen Trees.—White cedar or Arbor Vitæ, *Thuya occidentalis.* There are many varieties of this, the hardiest being *Thuya occidentalis Wareana,* known as Siberian Arbor Vitæ; Swiss Stone pine, *Pinus Cembra;* Dwarf Mountain pine, *Pinus Montana Mughus*; Savin or Juniper, *Juniperus horizontalis* (*Sabina*). The last two named are really shrubs.

Shrubs.—Bush honeysuckle, *Lonicera tatarica,* and varieties; Albert Regel's honeysuckle, *Lonicera Alberti;* Siberian Pea tree, *Caragana arborescens;* Shrubby caragana, *Caragana frutescens;* Dwarf caragana, *Caragana pygmaea;* Common lilac, *Syringa vulgaris.* Many varieties of this can be grown. Josika's lilac, *Syringa Josikaea;* Himalayan, or Chinese lilac, *Syringa villosa;* Japanese or Tree lilac, *Syringa japonica;* and *Syringa amurensis,* resembling it very much. High Bush cranberry, *Viburnum Opulus;* Choke Cherry, *Prunus virginiana;* Cherry, *Prunus Maackii;* Missouri or Golden currant, *Ribes aureum*; Van Houtte's Spiræa, *Spiræa Van Houttei, Spiræa arguta*; Sorbus-leaved spiræa, *Spiræa Sorbifolia*; Golden-leaved spiræa, *Physocarpus opulifolia aurea;* Meadow sweet (native), *Spiræa salicifolia; Spiræa Billardii; Cotoneaster acutifolia; Cotoneaster integerrima (vulgaris);* Juneberry or Saskatoon berry, *Amelanchier alnifolia;* Siberian Dogwood, *Cornus alba sibirica; Euonymus linearis;* Snowberry (native), *Symphoricarpus occidentalis.*

Roses.—Japanese rose, *Rosa rugosa* and hybrids and several native species; also Persian Yellow and Old English Moss. Hybrid Perpetual roses should be protected by covering with soil in winter, and if so treated the following should succeed:—Madame Plantier (white), Frau Karl Druschki (white), Magna Charta (bright rose), General Jacqueminot (crimson scarlet), Mrs. John Laing (soft pink), Ulrich Brunner (cherry crimson), Baronne de Bonstetten (velvety blackish-crimson), Mrs. R. G. Sharman Crawford (deep, rosy pink), Madame Joly (pink), John Hopper (rose pink), Prince Camille de Rohan (deep velvety crimson), Pierre Notting (deep crimson).

Climbing Plants.—Virginia Creeper, *Ampelopsis quinquefolia;* Native Clematis, *Clematis ligusticifolia,* a very desirable native species; Frost-grape, *Vitis vulpina,* native of southern Manitoba, but not adapted to the open prairie; Climbing Bittersweet (native), *Celastrus scandens;* Wild hop.

Herbaceous Perennials.—Many species and varieties of herbaceous perennials succeed in the prairie provinces. Among the most desirable are pæonies, German iris, perennial phlox, oriental and Iceland poppies, bleeding heart, coreopsis, yellow day lilies *(Hemerocallis)*, delphiniums, campanulas, platycodon. For lists of varieties, see the bulletin on Herbaceous Perennials, which can be obtained free on application to the Central Experimental Farm, Ottawa.

Annuals.—Annuals succeed admirably in the Prairie Provinces, and many kinds can be grown successfully. Among the most satisfactory are the sweet pea pansy, stocks, petunia, aster, verbena, pinks, nemesia, poppy, phlox Drummondi, and lobelia, but many more might be named. Geraniums, cannas, dahlias and gladioli, if started early, succeed well.

EXPERIMENTAL FARM, AGASSIZ, BRITISH COLUMBIA.

REPORT OF THE SUPERINTENDENT, P. H. MOORE, B.S.A.

Horticulture is not now receiving the special attention here that it did for many years, as the situation of this Farm was found not to be very suitable for fruit trees. Some attention is, however, paid to this part of the work, and following will be found a report on some experiments conducted in 1912.

VEGETABLES.

POTATOES.

Thirty-one varieties of potatoes were grown in 1912, on land similar to that which grew roots and corn and treated very much in the same manner, with the exception of artificial fertilizer. They were planted in rows two and one-half feet apart and from a foot to a foot and one-half apart in the drills. An accident happened to three varieties so that the following list contains only twenty-eight.

All potatoes were somewhat touched with blight, but the percentage of rot at digging time was not very great in any case.

Variety.	Yield per Acre.		Planted.	Harvested.	Rotten.	Small.	Marketable.
	Tons.	Lb.	1912.	1912.	%	%	%
American Wonder	10	856	May 7	Sept. 9	5	15	80
Early Envoy	9	1,276	" 7	" 6	10	15	75
Money Maker	9	1,272	" 7	" 9	10	25	65
Everett	9	348	" 7	" 6	5	25	70
Empire State	9	876	" 7	" 5	8	7	85
Dreer's Standard	8	1,169	" 7	" 12	5	20	75
Dalmeny Beauty	8	1,028	" 7	" 10	6	10	84
Burnaby Mammoth	8	1,028	" 7	" 18	6	20	74
Morgan Seedling	8	368	" 7	" 18	10	20	70
Late Puritan	8	236	" 7	" 13	10	15	75
Gold Coin	7	1,312	" 7	Oct. 2	5	20	75
Early St. George	7	916	" 7	Sept. 5	5	25	70
Vick's Extra Early	7	784	" 7	" 5	5	25	70
Rochester Rose	7	1,840	" 7	" 14	8	17	75
Rochester Rose (Lacombe Seed)	7	1,312	" 7	" 14	6	20	74
Irish Cobbler	7	1,312	" 7	" 16	10	25	65
Early Rose	6	1,728	" 7	" 18	8	30	62
Ashleaf Kidney	6	1,728	" 7	" 20	10	25	65
20th Century	6	1,728	" 7	Oct. 4	8	20	72
Hillcrest	6	276	" 7	Sept. 11	8	24	68
Reeves' Rose (Lacombe Seed)	5	1,880	" 7	" 12	10	20	70
Reeves' Rose	5	1,748	" 7	" 12	10	20	70
Early Potentate	5	824	" 7	" 12	8	20	72
Bovee	5	956	" 7	" 10	10	20	70
Wee McGregor	5	428	" 7	" 11	5	25	70
Hard to Beat	4	448	" 7	" 5	3	32	65
Table Talk	3	732	" 7	" 10	12	28	60
Factor	3	600	" 7	" 11	10	30	60

A fertilizer experiment was carried on with potatoes, the fertilizer being supplied by the German Potash Syndicate. Three-quarters of an acre of land was used in this experiment, and the following are the results of the different plots:—

Plot No.	Fertilizer Applied per Acre.	Planted.	Harvested.	Yield per Acre.
		1912.	1912.	
1	(Check)........................	May 9	Oct. 26	11 tons, 600 pounds.
2	200 pounds sulphate of potash........................	" 9	" 26	13 " 160 "
	400 " superphosphate.			
	140 " nitrate of soda.			
3	400 " superphosphate........................	" 9	" 26	12 " 1,420 "
	140 " nitrate of soda.			

Not being able to secure enough of one variety of seed to plant the three-quarters of an acre, we were forced to use Dakota Reds. The seed planted was very large and rough, and the crop harvested could also be described in the same way. The market value of same was not very high.

During the season a large variety of seeds were tested under conditions here. The land was a light, sandy soil and not very rich; the season being a dark and cool one. Such vegetables as require a warm, bright summer did not come to maturity. In the case of radishes, turnips, Brussels sprouts, cabbage, and cauliflower, the real comparative value of the variety tests was much interfered with by the cabbage maggots, as on these vegetables several different mixtures were tried for the prevention of the maggots and this made these plots not of a comparative nature.

BEETS.

Five varieties of beets were grown during the season with the following results. The weight of the crops is taken from two drills thirty feet long. They were harvested when fit for table use as a market garden product.

Variety.	Planted.	Harvested.	Weight of Crop.
Egyptian Dark Red Turnip........................	May 6, 1912	Oct. 9, 1912	8 pounds.
Meteor........................	"	"	10 "
Ruby Dulcet........................	"	"	55 "
Early Blood Red Turnip........................	"	"	17 "
Black-red Ball........................	"	"	18 "

PARSNIPS.

One variety of this vegetable was grown and gave a good return. The weight is taken from two thirty-foot drills.

Variety.	Planted.	Harvested.	Weight.
Hollow Crown........................	April 13, 1912...	Oct. 9, 1912.....	92½ pounds.

SALSIFY.

One variety of this was tested and it gave the following results:—

Variety.	Planted.	Harvested.	Weight.
Long White	April 13, 1912	Oct. 9, 1912	47 pounds.

PEAS.

There were eleven varieties of peas grown, one variety, Stratagem, germinated badly and the moles attacked other varieties, but the general results were as follows. All were harvested for table use. Weights are taken from one drill thirty feet long.

Variety.	Planted.	Ready for use.	Weight of Crop.
Thomas Laxton	April 12, 1912.	June 19, 1912.	5·10 lbs.
Gregory's Surprise	" "	June 16, 1912.	6·14 "
Gradus	" "	June 19, 1912.	8· 7 "
Telephone	" "	June 7, 1912.	13·13 "
Stratagem	" "	July 12, 1912.	8· 2 "
McLean Advancer	" "	July 12, 1912.	11· 8 "
Sutton's Excelsior	" "	June 25, 1912.	11·13 "
American Wonder	" "	June 21, 1912.	14· 5 "
Juno	" "	July 13, 1912.	10· 3 "
Premium Gem	" "	June 22, 1912.	15· "
Heroine	" 17 "	July 13, 1912.	20· "

CUCUMBERS.

Three varieties of cucumbers were grown and the weights in the following table were taken from an average of three hills and taken at a time when fit for market use. The Peerless White Spine was the most prolific yielder, but the quality of all three varieties was excellent.

Variety.	Planted.	Weight.
Cool and Crisp	May 25, 1912	19 lbs.
Peerless White Spine	" 25, 1912	27 "
Giant Pera	" 25, 1912	22 .

MUSKMELONS AND WATERMELONS.

Many varieties of melons have been tried for the past two years but without success in ripening any of them. In some cases fruit formed but it was always too small to be of use.

Of muskmelons, the following varieties were tested: Earliest Ripe, Paul Rose, Montreal Market, Hoodoo, Hackensack, Emerald Gem; and two kinds of watermelons were also grown, namely Salzer's Earliest and Thennings.

CORN.

Eight varieties of sweet corn were tested with results as tabulated below. The weights were taken from an average of ten hills. Stowell's Evergreen which is reported as a failure, was so on account of poor seed and non-germination of same; what few plants did grow were weakly and sick. All corn was harvested in the roasting stage or fit for table use.

Variety.	Planted.	Weight.
Early Evergreen	April 25, 1912	47½ lbs.
Fordhook Early	" 29, 1912	42 "
Henderson's Metropolitan	" 29, 1912	39 "
Country Gentleman	" 25, 1912	36 "
Black Mexican	May 5, 1912	34·1 "
Malakoff	April 29, 1912	30 "
Golden Bantam	" 25, 1912	21·4 "
Stowell's Evergreen	" 25, 1912	Failure.

SQUASH.

Seven varieties of squash were grown and all were harvested while in the growing stage. The weights given are taken from three average hills. The long Vegetable Marrow has proven the most prolific this season, but all the others had a good quality of vegetable.

Variety.	Planted.	Weight.
Long Vegetable Marrow	April 15, 1912	392 lbs.
Delicata	" "	223 "
Hubbard	" "	220½ "
Custard Marrow White Bush Scallop	" "	202¾ "
Mammoth White	" "	202½ "
Long White Bush Marrow	" "	183¼ "
Summer Crookneck	" "	66½ "

CABBAGE.

These varieties of cabbages came through after having been planted several times and having had several different treatments for cabbage maggot, therefore the results are not considered at all comparable. The weights were taken from average hills.

Variety.	Planted.	Weights.
Flat Swedish	March 29, 1912	82 pounds.
Large Late Flat Drumhead	" 29, 1912	75 "
Lubeck	" 29, 1912	60 "
Extra Amager Danish Ballhead	" 29, 1912	56½ "
Red Danish Stonehead	" 29, 1912	47½ "
Copenhagen Market	" 29, 1912	45 "
Fottler's Improved Brunswick	" 29, 1912	41½ "
Improved Amager Roundhead	" 29, 1912	40 "
Danish Delicatesse Red	" 29, 1912	36½ "
Danish Summer Ballhead	" 29, 1912	36 "
Extra Early Midsummer Savoy	" 29, 1912	28½ "
Winningstadt	" 29, 1912	25 "
Small Erfurt	" 25, 1912	25½ "
Early Jersey Wakefield	" 29, 1912	20½ "
Magdeburg	" 29, 1912	30 "
Early Paris Market	" 25, 1912	14 "

LETTUCE.

Fourteen varieties of this vegetable were grown and they were weighed when in a stage fit for market use. Th weights were taken from fifteen foot drills.

Variety.	Planted.	Weights.
Giant Crystal Head	March 25, 1912	63 pounds.
" " (seed bed)	" 29, 1912	60 "
Dark Green Capucine	" 29, 1912	51 "
Grand Rapids	" 29, 1912	45 "
Cos Trianon	" 29, 1912	45 "
Black Seeded Simpson	" 29, 1912	45 "
Improved Hanson	" 29, 1912	39 "
Rousseau Blond Winter	" 29, 1912	36 "
Crisp as Ice	" 29, 1912	18 "
Unrivalled Summer	" 29, 1912	15 "
Iceberg	" 29, 912	Seeded ear y
Wheeler's Tom Thumb	" 29, 1912	"
Red Edged Victoria	" 29, 1912	"

BEANS.

Seven varieties of beans were grown; they were all harvested in the green bean condition, and the weights were taken from one drill forty feet long.

Variety.	Planted.	Weights.
Keeney's Rustless Wax	April 17, 1912	30 pounds.
Early Refugee	" 17, 1912	37 2 "
Challenge Black Wax	" 17, 1912	30 "
Refugee or 1,000 to 1	" 17, 1912	28 "
Valentine	" 17, 1912	40 "
Wardwell's Kidney Wax	" 17, 1912	29·6 "
Stringless Green Pod	" 17, 1912	32 "

ARTICHOKES.

One variety of this vegetable was grown, and the result was as follows. The weights were taken from one drill sixty feet long, wherein the plants were two feet apart.

Variety.	Planted.	Weights.
New White	April 5, 1912	278½ pounds.

ONIONS.

Four varieties of these were planted, but the land was not rich enough to grow a good crop of them, and what spoiled our experiment was the moles getting in and rooting out the plants, which made the results of the onions not comparable in any way.

TOMATOES.

Eleven varieties of tomatoes were grown, and the weight of the yield was taken from five average plants The hop flea gave the plants a severe check at one time of the season, but, by judicious pruning, all the tomatoes were ripened, and the quality, in almost every case, was good. The following results were obtained from ripened tomatoes:—

Variety.	Planted.	Weights. (Five plants). Lbs.	oz.
Sparks Earliana, (Sunnybrook Strain)	March 26, 1912	22½	..
Sparks Earliana (C.E.F)	"	21	2
Rennie's XXX Earliest	"	14	..
Florida Special	"	19½	.
Sparks Earliana 12-8 Strain (C.E.F)	"	16¼	..
Sparks Earliana 12-8 Strain (C.E.F)	"	13	2
Bonny Best	"	14	6
Livingston's Globe	"	18¼	..
Trophy	"	30	9
Chalk's Early Jewel	"	16¾	..
Matchless	"	21½	..

REPORT OF EXPERIMENTS ON THE FRUIT FARM OF THOS. A. SHARPE, SALMON ARM, B. C.

The soil on this farm is mostly gravelly loam and, with proper preparation, is excellent for the production of clover and alfalfa, and of suitable varieties of apples, plums, prunes, sour cherries and all small fruits.

Potatoes were exceptionally good in quality this year.

In 1908 thirty-nine varieties of plums and prunes were planted.

APPLES.

Of the apples, nineteen varieties fruited in 1912; of these, Longfield, Jonathan, Ira and Newtown Pippin fruited freely, and are all valuable varieties. The others produced only a few specimens not sufficient to judge of their quality or productiveness.

There were also fifty-eight varieties of apples planted in the experimental orchard in 1911 and 1912, and nearly thirty varieties either in nursery on the Farm or ordered for this spring's planting.

CHERRIES.

Two varieties were planted, Olivet and Planchoury. Both produced good crops of fine fruit, of excellent quality for shipping and canning, as well as for eating out of hand. Two varieties are planted in nursery and about twenty ordered for this spring's planting.

PLUMS AND PRUNES.

All the varieties of plums and prunes fruited. German prune, Shropshire damson and Primate were the best in quality and productiveness, Purple being a good second. These are all good shippers. Two varieties of Reine Claude fruited, but ripened so late that they are evidently not adapted to this district.

About twelve varieties of plums have been ordered for this season's planting.

PEARS.

There are thirty-eight varieties planted in the orchard, and several sorts in the nursery.

SMALL FRUITS.

Blackberries.—Eldorado, Snyder, and Stone's Hardy. These have grown vigorously and fruited well without winter protection.

Red Raspberries.—Cuthbert, Pauline, Columbian and King. These have proved vigorous and fruitful, also without protection.

Grapes.—Saunders' Seedling, Delaware, Brighton and Worden. These were all vigorous growers and ripened their fruit.

Many of the above-mentioned varieties of fruit are selected sorts, got from British and European nurseries for the Experimental Farm at Agassiz, B.C., and proved as being tested there, to be of sufficient merit to justify the test in the Salmon Arm district.

New varieties of merit will be added as opportunity offers. The annual rainfall in this district is light, but, as there is seldom any frost in the ground during the winter, the melting snows sink into the soil, and this carries the growth well on into June, when, as a rule, there is a fair amount of precipitation in the form of gentle rains. There is, thus, quite sufficient moisture to enable the crops to mature, and a failure has not been recorded for over twenty years. On the uplands there are seldom late spring or early autumn frosts, tomatoes, garden corn, muskmelons and watermelons ripening well.

EXPERIMENTAL SUB-STATION, FORT VERMILION, PEACE RIVER DISTRICT, ALBERTA.

This station is situated in the valley of the Peace river in latitude 58° 23'. It is over 300 miles north of Edmonton, and is in charge of Mr. Robert Jones, who has prepared the following report:—

The spring of 1912 opened very early, the snow starting to thaw during the early part of April. Seeding was begun on April 29, but was not general until May 2. May opened very dry and continued so throughout the month, and, as a result, growth was very slow. June was very dry and hot, with only 7/100 of an inch of rain during the whole month. This gave the crops a permanent set-back which all the rains of July could not remedy. The crops that were not ploughed under were very light.

July opened showery and cold, a slight frost occurring on the nights of the 9th, 14th and 19th, which did considerable damage. The first part of August was showery, and the ripening period was prolonged. From the 13th to the 24th, however, the weather was good, and considerable cutting was done on the experimental plots. Frost occurred three times towards the end of the month.

VEGETABLES.

Seeds sown in hotbeds April 19 to 21, transplanted to the open ground May 20 to 26.

ASPARAGUS.

Conovers' Colossal, one year old plants, in use May 22; large and good.

BEANS, GARDEN.

Sown May 2 in drills 30 inches apart: Stringless Green Pod, fit for table August 26; Challenge Black Wax, in use August 17. Neither of these did ripen.

BEETS, TABLE.

Early Blood Red Turnip, sown May 6, in use July 15. Egyptian Dark Red Flat, sown May 6, taken up September 11. Early Dark Red Egyptian Turnip, sown May 6, very long, all very large.

CABBAGE.

Early Jersey Wakefield, in use July 29; average weight, August 29, 14½ pounds. Danish Ballhead, average weight, August 29, 4½ pounds. Kildonan, very good and firm; average weight August 29, 6 pounds. Red Rock, very fine and solid; average weight, August 29, 5½ pounds.

CARROTS.

Early Horn, sown May 6; fit for use June 29; fine flavour. Half Long Chantenay, sown May 6; fit for use July 5; very fine, very large when pulled on September 11; yield, 720 pounds.

CAULIFLOWER

Early Snowball, in use July 15; average weight, August 29, 12 pounds. Early Dwarf Erfurt, in use July 10; average weight, August 29, 10 pounds.

CELERY.

White Plume, in use August 29; very large and crisp. Evans Triumph, in use September 5; medium in size but fine. Golden Self Blanching, in use September 15; small.

CUCUMBER.

Peerless White Spine, Cool and Crisp; some of the cucumbers were about 4 inches long when picked, very small. Both these varieties were considerably cut by frost in July.

LETTUCE.

Sown May 2; 1 row each of following varieties: Wheeler's Tom Thumb, Unrivalled Summer, Cos Trianon, All Heart; in use May 28; very fine and crisp.

MUSKMELON.

Miller's Cream Nutmeg, killed by frost in July.

PARSLEY.

Moss Curled, sown May 6; in use from early part of June.

PARSNIP.

Hollow Crown, sown May 6; fine and large when taken up September 11.

PEAS, GARDEN.

Sown May 2, 1912; the peas sown in drills thirty inches apart. Henderson's First of All, vines 22 inches long, pods 3 inches long, peas of a fine flavour; fit for the table July 8; ripe August 1. Gregory's Surprise, vine 24 inches long, pods of medium length containing from four to six medium large peas of a very fine quality; fit for use, July 22; ripe, August 1. Witham Wonder, vines 24 to 30 inches long and productive; pod 3 inches long; peas very fine; fit for table, July 10; ripe, August 5. Gradus, vines 34 inches long and moderately productive, pods 3½ inches and well filled with large peas of a good quality; fit for table, July 29; ripe, August 26. Premium Gem, vines 15 inches to 20 inches long, pod of a medium weight; in use, July 5; ripe, August 20. Stratagem, vines 36 inches long, pods long (4 inches), containing from six to nine large sweet peas of very fine quality; fit for table, July 15; ripe, August 3. American Wonder, vines of a medium length and very productive, pods 3½ inches long, filled with peas of good size and fine quality; fit for table, July 1; ripe, August 3. Admiral Dewey, vines from 18 to 20 inches long, pods from 3 to 4 inches long; peas of a delicious quality; fit for use, July 25; ripe, July 27.

RADISH.

Sown May 2. New Triumph, Early Scarlet White Tipped Turnip, Winter Black Spanish; fit for use, May 30; very good.

RHUBARB.

Victoria; in use, May 27.

Flowers at the Fort Vermilion, Sub-Station, 1912.

Apple Orchard at the Fort Vermilion Sub-Station, 1912.

SPINACH.

Broad Thick Leaved, sown May 6; in use June 1.

SQUASH AND MARROWS.

Four hills of each of the following, sown May 8, planted 6 feet apart each way: Mammoth Whale, average weight at the end of August, 16 pounds; Summer Crookneck, average weight at the end of August, 2 pounds; English Vegetable Marrow, average weight at the end of August, 6 pounds; Hubbard, average weight at the end of August, 4 pounds; Boston, fit for use July 25, average weight when picked August 31, 5 pounds. White Bush Scallop, very small when picked. White Congo, seeds of this did not germinate.

TURNIP, TABLE.

Extra Early White Milan, sown May 21, fit for use June 19; from plot of one-sixtieth acre the yield was 720 pounds when pulled September 11; very large turnips.

TOMATO.

One small package each of following varieties sown under glass April 23; transplanted to the open ground May 29:—Sparks Earliana, C. E. F. strain, 1911; Most productive and early strain, 7-21; Atlantic Prize. Of these different kinds, 135 plants were transplanted and these were doing very well up to July 14, when there was a severe frost and they were cut right down. There were just a very few small ones, and very green, on September 1.

POTATOES.—Test of Varieties.

No.	Name of Variety.	1st Plot Sown.	1st Plot Pulled.	Yield per acre 1st Plot.		Description of Variety.
				Bush.	Lb.	
1	Irish Cobbler	May 1	Sept. 20	96	..	Round, white, very small.
2	Gold Coin	" 1	" 20	168	..	White, small.
3	Carman No. 1	" 2	" 20	288	..	Oval, white, medium.
4	Early Rose	" 4	" 18	220	..	Pink, medium.
5	Rochester Rose	June 6	" 21	*		Pink, medium.

* From 5 pounds; yield, when dug on September 21, 60 pounds.

INDIAN CORN.—Test of Varieties.

No.	Name of Variety.	Date Sown.	Date Cut.	Height.	Condition when Cut.	Weight of Green Fodder per Acre.	
	Table Corn.			Inches.		Tons.	Lb.
1	Early C. E. F. Malakoff	May 4	Sept. 6	28	In tassel Aug. 15, just coming in silk when cut.	6	1,920
2	E. E. W. Cory	" 6	" 6	38	Just coming into tassel.	6	1,920
3	Dwarf, Semi-sweet	" 4	" 6	24	....	4	700

The plot of one-sixtieth of an acre of a dwarf semi-sweet corn seed sent me by Mr. R. C. Phipps from Colorado. This variety was in tassel August 6, in silk, August 26, Corn was formed but very green until cut.

Flower Garden.—Test of Varieties.

Sown in open garden from May 20 to May 21.

No.	Variety.	When in Bloom.	Remarks
1	Helichrysum	August 8	Double, very good.
2	Portulaca	" 19	Mixed colours, large and fine.
3	Gaillardia	" 24	Very good.
4	Mignonette	July 15	Good.
5	Clarkia	August 3	Very good.
6	Phlox Drummondi	" 20	Good.
7	Godetia	" 9	Large and very good.
8	Salpiglossis	" 14	Very good.
9	Scabiosa	" 27	Good.
10	Brachycome	" 1	Very good.
11	Coreopsis	" 30	"
12	Stocks	" 12	Large.
13	Abronia umbellata	July 31	Good.
14	California Poppy	June 18	"
15	Japan Poppy Double Mixed	July 6	Very good.
16	Shirley Poppy	June 25	Good.
17	White Swan Poppy	July 13	"
18	Double Annual Poppy	" 18	Very good.
19	Ageratum	" 27	Good.
20	Semple's Branching Aster	August 7	Very good, colour pink.
21	Sweet Peas, 6 varieties	July 25	Many colours, very good.
22	Candytuft, Empress White	June 19	Large and good.
23	Dianthus or Pinks	July 8	Good.
24	Single Poppy	" 11	Very good.
25	Primula	" 24	Very large and pink.
26	Delphinium	June 30	Very good.
27	Centaurea or Dusty Miller	August 9	Good.
28	Nasturtium, tall	" 1	Very good.
29	" dwarf	" 1	"

All in bloom until the frost, September 23.

Sown in hotbed, April 20 to 25; planted in open, May 18 to 22.

No.	Variety.	When in bloom.	Remarks.
1	Antirrhinum	July 29	Good, many colours.
2	Asters, 4 varieties	" 29	Good.
3	Brachycome	June 25	Very brilliant.
4	Stocks	July 20	These could not be better.
5	Balsam	" 19	Very good.
6	Zinnia, dwarf, scarlet	" 12	Good.
7	Pansies, 8 varieties	June 5	The finest ever produced here.
8	Verbena, Mammoth White	July 10	Could not be better.
9	Phlox mixed	" 22	Very good.
10	Lavatera, Rosea Splendens	" 30	"
11	Chrysanthemum, Eclipse	" 5	"
12	Celosia	August 1	Good.
13	Marigold, dwarf	July 1	"
14	Alyssum	June 6	Very good.

ORNAMENTAL TREES AND SHRUBS UNDER TEST.

2 *Acer tataricum Ginnala* (Ginnalian maple), doing well.
2. *Acer saccharinum* (*dasycarpum*), (Silver maple), doing well.
4 *Acer Negundo* (Box elder or Manitoba maple), doing well.

4 *Acer tataricum,* doing fine.
2 *Acer pictum,* good.
2 *Picea excelsa Remontii,* good.
2 *Amelanchier vulgaris,* doing well.
2 *Betula alba laciniata* (Cut-leaved birch), doing well.
4 *Berberis Thunbergii* (Thunberg's barberry), doing very well.
1 *Clematis montana,* doing well.
2 *Caragana arborescens* (Siberian pea tree), doing well; in bloom May 21.
2 *Caragana grandiflora,* doing very well; in bloom May 30, 1912.
2 *Caragana frutescens,* doing well; in bloom May 28, 1912.
2 *Caragana pygmæa,* doing well; in bloom May 28.
2 *Cotoneaster tomentosa,* fair.
2 *Cratægus Arnoldiana,* good.
2 *Celtis occidentalis,* doing well.
4 *Crataegus Carrieri,* doing well.
2 *Ceanothus americanus,* doing nicely.
2 *Lonicera alpina,* doing very well; in bloom May 30.
3 *Lonicera Mundeniensis,* doing well; in bloom May 29, 1912.
2 *Lonicera Fenzlei.*
2 *Lonicera tatarica virginalis alba.*
2 *Lonicera Sullivantii.*
2 *Delphinium,* doing well; in bloom June 6, 1912. Herbaceous perennial.
1 *Diervilla lutea.*
3 *Euonymus europeus ovatus,* doing well; in bloom May 25.
2 *Hydrangea paniculata grandiflora.*
2 *Ligustrum amurense* (Amur privet).
2 *Fraxinus pennsylvanica lanceolata* (green ash).
2 *Populus angustifolia.*
2 *Lycium europaeum.*
2 *Philadelphus Lemoinei Mont Blanc.*
2 *Pseudotsuga Douglasii* (Douglas fir).
4 *Pinus Sylvestris* (Scotch pine).
1 *Spiræa Billardii.*
2 *Picea pungens* (blue spruce).
2 *Pinus Strobus* (white pine).
2 *Quercus rubra* (red oak).
2 *Rhamnus Frangula* (Alder Buckthorn).
2 *Ribes aureum* (Missouri Currant.
2 *Cupressus* (*Retinospora*) *pisifera.*
6 *White Birch,* doing fairly well.
1 *Syringa amurensis,* doing well.
1 *Syringa Japonica* (tree lilac), doing very well; in bloom June 25, 1912.
2 *Lilac Madam Casimir Perier,* only fair.
2 *Lilac Chas. Joly,* doing fairly well.
2 *Lilac Charles Tenth,* doing well; in bloom June 10, 1912.
2 *Lilac Michel Buchner,* only medium.
2 *Lilac Emile Lemoine,* doing well; in bloom June 7, 1912.
2 *Lilac Jacques Calot,* doing well.
2 *Syringa pekinensis,* doing well.
2 *Lilac Congo,* doing well.
6 *Syringa villosa,* doing very well; in bloom June 14, 1912.
2 *Lilac Mdlle. Fernande Viger,* doing quite well.
2 *Thuga occidentalis Columbia,* doing well.

2 *Lilac Mdme. Abel Chatenay,* doing fairly well.
2 *Spirea arguta,* only medium.
2 *Salix Voronesh* (golden willow), doing very well.
6 *Thuga occidentalis,* doing well.
2 *Thuga occidentalis globosa,* doing well.
1 *Thuga occidentalis, Hoveyi,* doing well.
1 *Viburnum molle,* doing very well.
1 *Syringa chinensis (rothomagensis),* doing well.
1 *Lilac,* no name, doing well, in bloom June 17, 1912.
1 *Hippophae rhamnoides* (sea buckthorn), doing well.
1 *Rose delicata,* doing well.
1 *Rose rugosa alba,* doing well; in bloom July 9, 1912.
1 *Spirea sorbifolia,* doing very well; in bloom June 22, 1912.
3 *Amelanchier* (June berries), doing well; did not bloom this spring.

FRUITS UNDER TEST.

Cross-bred Apples.—Behaviour of Trees.

2 *Alberta.*—September 1, 1912, doing well.
2 *Charles.*—Have done very well.
2 *Tony.*—Doing only fairly well.
2 *Prince.*—Doing fairly well.
2 *Golden.*—Doing well.
2 *Magnus.*—Has done well.
2 *Silvia.*—Quite good.
2 *Robin.*—Only fair.
2 *Pioneer.*—Good.

Seedlings of Cross-bred Apples.

2 *Seedling of Alberta.*—Doing very well.
2 *Seedling of Golden.*—Quite good.
3 *Seedling of Jewel.*—Good.
2 *Seedling of Silvia.*—Have made good growth.

Russian Apple Seedlings.

1 *Varna.*—Very good.
1 *Charlamoff.*—Doing fairly well.
1 *Morden.*—Doing very well.

Plums.

1 *Cheney.*—Doing poorly.
1 *Aitkin.*—Doing poorly.

Raspberries.

75 *Herbert.*—These have made very strong growth; 4 pints of fruit.
75 *Heebner.*—Have done well; 2 pints of fruit, picked August 5, 1912.

BLACK CURRANTS.

All of the black currants were in bloom from May 25 to June 1, and were picked August 3; medium in size.

Black Currants.—Varieties Tested and Yields.

2 Bang Up, 7 pints.
2 Norton, 3½ pints.
2 Kerry, 10 pints.
Climax, 7 pints.
Topsy, 5 pints.
Eclipse, 7 pints.
2 Magnus, 6½ pints.
2 Saunders, 10 pints.
Ethel, 11 pints.
Ontario, 8 pints.
Eagle, 7 points.

RED CURRANTS.

In bloom May 22; picked July 29, 1912.

2 Simcoe, 2 pints.
2 Rankin's Red, 3 pints.
Greenfield, medium in size, 7 pints.
Moore's Seedling, 4½ pints.
Goliath, 6 pints.
Red Dutch 10½ pints.
Large Red, 3 pints.
Long Bunch Holland, 8 pints.
Cumberland Red, 5 pints.

WHITE CURRANTS.

2 Large White, in bloom May 20, 1 pint.
2 White Grape, picked July 30, 1 pint.
2 White Cherry, very small in size, 1 pint.
2 White Kaiser, 1 pint.
2 White Dutch, 1 pint.

EXPERIMENTAL SUB-STATION, GROUARD, LESSER SLAVE LAKE, ALTA. (Lat. 55° 31′.)

The Fathers of the Mission were the first to practise farming at this point, on a large scale. Having begun agricultural operations in the district some eighteen years ago, they are now fairly in a position to give an exact report on the possibility of growing cereals, such as wheat, barley and oats, as well as roots and vegetables near Lesser Slave lake.

The village of Grouard is situated at the northwest end of Lesser Slave lake, and is bounded by the forest on the east side, with very little open ground between that and the lake. The arable land here is limited in area, but here and there one finds clear spaces for cultivation. The land bordering on the lake is very sandy. To extend the cultivated area it was necessary to clear the forest and, accordingly, about ten acres of new land was made. This work was commenced in 1894. The forest land is generally good, with four or five inches of humus on the surface. The subsoil is of friable clay. Grain does well on this land, but it has been little grown, potatoes and vegetables being sown in preference.

The success obtained in growing cereals and potatoes has been decided enough in spite of some temporary set-backs from drought and frost (the latter rarely, twice in eighteen years) to encourage the breaking of new land in order to practise rotations as far as required. These rotations allowed the sowing of some eighty acres in grain for several years without growing the same crop on the same land oftener than once in three years.

Currants fruited freely in 1912 and a tree of *Pyrus baccata* produced fruit which was harvested September 11.

FLOWER GARDEN.

Sown in hotbed April 3; transplanted in garden June 12. All flowered freely until frost came October 1: Alyssum, ageratum, antirrhinum, 2 varieties; asters, 3 varieties; balsam, phlox Drummondii, stocks, 4 varieties; godetias, 4 varieties; clarkias, 4 varieties; chrysanthemums, 2 varieties; marigold.

In addition to the above, many varieties were sown in the autumn, on October 21, 1911, including godetia, clarkia, pansies, sweet peas, phlox, poppies, and larkspur. All these varieties commenced to flower the first week in July.

PERENNIALS.

Achillea, columbine, campanula, calycanthus, Delphinium Belladonna, *Delphinium formosa hybrida.*

All these flowered well throughout the season.

Note on sowing flower seeds in Autumn.

Any land, preferably a little dry, will do. The plants are more vigorous than those sown in the spring. Some varieties are as far advanced as if sown in the hotbeds in spring. The seed should be sown only at the approach of severe frost. They may be sown in their permanent places or in the nursery for replanting in the spring. They do better in early spring if trenches are made around the beds to carry off the streams of water when the snow melts.

VEGETABLES.

Early Rose potatoes were sown May 18 and dug September 26. The field of three acres yielded 600 bushels, or about one-third of the return from a field of the same size in 1911.

Two varieties each of carrots, beets, onions and celery gave good returns. Cabbage, garden peas, beans, tomatoes, lettuce, radish, turnips, pumpkins and squashes, without exception, gave very satisfactory crops of properly-matured vegetables.

The culture of the latter being specially under my charge, I will give the details of the results obtained this year.

Potatoes.—Early Rose. Three acres were planted in rows 3 feet apart. They were planted May 18 and dug September 26, the crop being 600 bushels, just one-third of the previous year.

Carrots.—Ox-heart and Chantenay, sown in garden April 26; good crop.

Beets.—Half-long and Eclipse, sown April 30.

Onions.—Yellow Danvers and Red Wethersfield, sown in the autumn, October 21. Both varieties yielded well.

Celery.—Paris Golden Yellow and White Plume. Set out in garden, May 28. Both varieties did well.

CABBAGE.

Lenormand, Paris Semi-hard, Snowball, Express, Etampes, Spring, Succession, Quintol; transplanted in garden end of May. All did well.

PEAS.

Alaska, sown April 29; ready for use July 4; good quality. Nott's Excelsior, sown May 7; very good quality. Thomas Laxton, sown May 7; very good quality.

BEANS.

Wardwell Kidney Wax, sown June 1; very good quality.

TOMATOES.

Sparks Earliana, Trophy, Dominion Day; sown in greenhouse March 14, like the other varieties, and transplanted in garden June 5; first gathering August 15.

LETTUCE.

May King, a good quality; Boston, a good quality; Nonpareil, the best tested.

RADISH.

Round Scarlet, sown first week in May; a good variety. Scarlet Half Long White Tipped, the best tested.

TURNIPS.

Field.—Mammoth Clyde; very poor crop this year.
Table Turnips.—Round White; good crop.

SUB-STATION, ATHABASKA LANDING.

It is much to be regretted that the pressure of other duties has compelled Bishop Robins to give up much of his experimental work at Athabaska Landing. In a letter received from him, he reports briefly on the character of the season of 1912 as follows:—

> 'The summer of last year was very dry at Athabaska Landing, and all garden industries suffered, by being dwarfed and late. Then, when rain came and a late spurt resulted, the August frost cut down all tender growth, including tomatoes, cucumbers, squash, and such things. The potato crop was very satisfactory. Green peas were late and yielded for a shorter time than usual, the taller varieties again doing better than the dwarfs. Beets and onions were light; indeed, the root products of the garden suffered most from lack of moisture.
>
> 'The cut worm troubled cabbages, and I did not know of the Paris green method of destruction at the time.
>
> 'The fruit trees have not shown their possibilities yet. You will remember, I received a new consignment. The currants among them flowered and fruited at once, but the others had no opportunity, as growth follows quickly after the planting season. They will prove themselves better this year.'

REPORTS OF EXPERIMENTS AT FORT SMITH, FORT RESOLUTION AND FORT PROVIDENCE, MACKENZIE DISTRICT.

Owing to the very poor success in the experimental work at the above points last year, it was thought advisable to discontinue the work for the present. However, the Fathers in charge of the Missions at these Forts have reported on their work for the season of 1912. The results, as a whole, are more encouraging than those of 1911, especially at Forts Resolution and Providence.

FORT SMITH (Latitude 60°).

At Fort Smith the season was a bad one in every respect. The snow had completely disappeared by April 20, but the land could not be worked before May 8. On the 9th and 10th some grain was sown and vegetable seeds, such as White Flat Strap-leaf Turnip, Swedes, Half-long Chantenay and French Horn Carrots, Early Blood Red and Egyptian-Red Beets, and Red Wethersfield Onions; Alaska, Cleveland's First and Best, McLean's Advancer and Gregory's Surprise Peas; also cabbages, radishes and lettuce.

On the 17th there was a slight snowfall, followed by a frost (26 degrees). This was followed by a drought, lasting throughout June, which did a lot of injury. In July, hail fell, and this was followed by a frost. In August there was frost again, which was especially injurious to the potato crop.

In brief, this has been the second consecutive year quite unfavourable for crops It is thought, however, that better results will be obtained as more clearing is done. The nearness of the woods retains the moisture, so that, at the least fall in temperature there is a frost. Every year, near the woods, there is a frost, while in the clear space near the river there is none. The land in the latter locality is not good, however, being very sandy, and will only produce a crop when well manured.

In the garden near the house, in a sandy soil, turnips were grown weighing up to 8 pounds each; carrots did well, many weighing 1½ pounds each; beets up to 3 pounds, but a large proportion had too many roots. Onions did not do well; few germinated, and these were very small. Peas did very well, though much later than the preceding year, not being ready for use until the end of July. They did not commence to ripen until the beginning of September. The Caractacus variety of pea seems still the best for this country, being earlier and more hardy. After these come Gregory's Surprise and Alaska; McLean's Advancer and Cleveland's First and Best are productive, but later. In another garden, some distance away, English Wonder and American Wonder peas were sown, but both sorts were frosted, owing to their nearness to the woods. The same happened to the tomatoes and beans. Squash produced a few flowers, but nothing afterwards.

FORT RESOLUTION.

Fort Resolution is situated on the Great Slave Lake, latitude 61° 14'.

At this sub-station the results, as a whole, were good. The condition and variety of the field and garden crops were a surprise to travellers from the more settled districts.

The early part of June was dry, but there was a light rainfall on the 10th, and a heavy one on the 30th. July was cold. Rain during the latter part of August was of great benefit to the potato crop.

On September 17 there was a heavy storm from the north, the temperature fell rapidly and the weather thereafter remained cold.

Onions did not yield a crop this year. Carrots and beets, sown May 17, were pulled September 18.

Four varieties of cabbage tested were all destroyed by dogs. Three varieties of lettuce, sown May 18, were in use July 12 to 15. Turnips, sown May 20, were fit for use July 30, and four varieties of peas, sown May 14, were in use July 30. Gregory's Surprise ripened September 15.

Some cross-bred apple seeds, sown in the greenhouse, March 18, produced plants ten to eleven inches high Apple seeds sown in the open did not come up. The two-year-old apple trees are some three feet high.

Ten varieties of flowers, sown in the greenhouse and transplanted May 14 to 20, bloomed from July 31 to August 31.

FORT PROVIDENCE.

The work at Fort Providence, which is at latitude 61° 16′, was not reported on very fully this year, as it was not well understood how much detail was required. Following are some notes on the results obtained:—

Lettuce, sown May 6, was above ground on June 3, and was fit for use June 22. Best varieties, Cos Trianon and Grand Rapids, both of which were cut four times.

Radishes were sown May 7, and were up on June 6; fit for use June 20 to 25.

Garden peas were sown May 7, and were up on June 6. Pods were formed on July 15, and the crop was harvested September 4.

Cauliflowers, sown May 10 gathered August 7; one weighed 2 pounds and another 1¾ pounds.

Cabbages, sown in March in boxes in the house; planted in garden, May 15; harvested September 15, to the number of 212, weighing from 4 to 5 pounds each. The heaviest was 6½ pounds.

Table beets were, as a rule, small. Carrots were of fair size, but a light crop.

The potato crop totalled 1,014 barrels.

The last spring frost was on June 2. There was a slight frost on July 23, and the first frost of autumn occurred on August 31.

Flowers were not a success this year.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM

THE CEREAL DIVISION

For the Fiscal Year ending March 31, 1913

PREPARED BY

Dominion Cerealist, Ottawa, Ont. - - - - - - - - - - Chas. E. Saunders, B.A., Ph.D.

Superintendent—

Experimental Station, Charlottetown, P.E.I. - - - J. A. Clark, B.S.A.
Experimental Farm, Nappan, N.S. - - - - - - - R. Robertson.
Experimental Station, Cap Rouge, Que. - - - - - Gus. A. Langelier.
Experimental Farm, Brandon, Man. - - - - - - - W. C. McKillican, B.S.A.
Experimental Farm, Indian Head, Sask. - - - - - Angus Mackay.
Experimental Station, Rosthern, Sask. - - - - - Wm. A. Munro, B.A., B.S.A.
Experimental Station, Scott, Sask. - - - - - - - R.E. Everest, B.S.A.
Experimental Station, Lethbridge, Alta. - - - - - W. H. Fairfield, M.S.
Experimental Station, Lacombe, Alta. - - - - - - G. H. Hutton, B.S.A.

Experimentalist at St. Bernard Mission, Grouard, Alta. - Rev. Bro. Laurent.
Experimental Station, Fort Vermilion, Alta. - - - - - In charge of Robt. Jones.
Superintendent of Experimental Station, Agassiz, B.C. - P. H. Moore, B.S.A.

REPORT FROM THE CEREAL DIVISION

OTTAWA, March 31, 1913.

J. H. GRISDALE, ESQ., B. Agr.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit the tenth Annual Report of the Cereal Division. This report is intended as a brief review only of the more important features of the work carried on between April 1, 1912, and March 31, 1913.

The season of 1912 was distinctly unfavourable for cereals over almost the whole of Canada. During the early part of the summer, drought and intense heat were prevalent; and these conditions were followed by months of wet, cool weather, about as unfavourable for the ripening and harvesting of grain as could well be imagined. Under such conditions, normal crops could not be expected, and the injury done to grain intended for seed purposes was very great. In some districts the heat and drought of early summer caused the young plants of cereals to produce a small number of heads rather prematurely. Later on, when wet weather came, stooling of the plants occurred and a considerable crop of late heads was produced. There was not time, as a rule, for these to ripen; but they grew to a good height and often quite overshadowed the earlier heads; so that when the first heads were ready for harvesting they were almost hidden beneath a mass of green stalks. Under conditions such as these it was quite impossible to make as accurate observations as usual on the dates of ripening of the various cereals. The yields obtained were also rather misleading, especially owing to the fact that the early-maturing varieties suffered most, because they were farther advanced when the wet weather set in, and were therefore less capable of recuperating.

The first severe frosts came rather later in autumn than usual. The results of the season were therefore less disastrous than might have been expected. The quality of the grain was, however, considerably lowered in most districts, while in some localities sprouting of the seed in the stooks occurred to a very serious extent.

Cereal investigations and the propagation of new and approved varieties for distribution and sale could not make very good progress in such an adverse season, but some valuable observations were made, and on some of the Experimental Farms a considerable quantity of seed grain of good germination was harvested.

VISITS TO BRANCH FARMS AND STATIONS.

The eastern Farms were visited in July and those in the west in August and September. The conditions affecting cereals were carefully studied, and plans were made, by consultation with the Superintendents, for modifications and improvements in the work whenever such seemed practicable.

At Cap Rouge the very unfavourable wet spring had been followed almost immediately by hot dry weather. Under such abnormal conditions the prospects for grain crops were very poor. At Charlottetown and Nappan the grain was in a much healthier state and gave promise of reasonably good yields.

Harvesting was in progress—between showers—at the western Farms when these were visited in August. While, for the reasons already explained, the season was

an unfavourable one for early-maturing varieties of grain, general satisfaction was found to prevail in regard to the harvest prospects for the early varieties of wheat, Marquis and Prelude. In most instances the high expectations were fully justified by the weight of grain threshed.

While the varieties of cereals under cultivation in some of the older-settled portions of Manitoba and Saskatchewan are satisfactory, and the need of new and improved kinds is not now very great, the condition of affairs is quite otherwise in northern districts and over a large portion of Alberta, where the early-maturing varieties of wheat hitherto introduced, including Marquis, cannot be depended on to ripen every season, especially when sown on summer-fallowed land. For these conditions, Prelude wheat will be of enormous value but tests are also required of a large number of the new cross-bred sorts produced by the Dominion Cerealist at Ottawa, and now available for trial elsewhere.

MARQUIS WHEAT.

Marquis wheat was so fully discussed in the report of last year that a passing reference will be sufficient on this occasion. The year 1912 has been another 'Marquis year,' owing to the conditions being rather unfavourable for the growing of Red Fife. Not only did Marquis give yields which, as usual, surpassed Red Fife on the great majority of farms, but the winning of the highest award at the International Dry-Farming Congress at Lethbridge last autumn attracted again the attention of the whole world to this variety. Marquis is now being grown by so many farmers in almost all parts of the western country that there has been no difficulty in securing good seed this winter. While any attempt to estimate the probable acreage of Marquis for this coming season will no doubt be quite inaccurate, it appears that at least one million acres of this variety will be sown. The widespread popularity of Marquis is all the more noteworthy when we recall that this variety was introduced into Saskatchewan in 1907, when about half a bushel of seed was sent from Ottawa for trial on the Experimental Farm at Indian Head. Almost the whole of the seed now in the farmers' hands traces back to that first shipment, very little seed grown at Ottawa having since been sent out.

Many excellent yields of Marquis wheat were reported last season, the most remarkable being on the Indian Head Farm, where a plot of one-fortieth of an acre gave a crop at the rate of over 81 bushels per acre. This is probably a world's record for spring wheat.

PRELUDE WHEAT.

Preliminary tests at Ottawa and at some of the branch Experimental Farms having clearly demonstrated the great value of this new variety, a few small samples were sent last spring to farmers in Saskatchewan and Alberta, so that a better idea might be obtained as to its adaptability to various districts. The tests on the branch farms were also increased in number and in acreage. The season was particularly unfavourable for varieties which develop rapidly, because excessive heat and drought prevailed during the early part of the summer, conditions which proved very trying to all grains which were moderately well advanced. Those sorts which develop slowly were not so seriously injured. In one or two cases, small plots of Prelude wheat were almost entirely destroyed during this period; but, on the whole, the record made by the new variety was most satisfactory, the yields in some instances being really remarkable.

Two special cases deserve mention. Mr. E. B. Cay, of Beatty (near Melfort), Sask., sowed five pounds of Prelude wheat on one-fifth of an acre of land, and threshed 603 pounds. Mr. W. J. Borton, of Bottrel, Alberta, sowed one pound of seed on a relatively large piece of land and secured 123 pounds of clean grain. Of

course in this case the wheat did not ripen so early as it would have done had it been sown more thickly. One would not advise extremely thin seeding under ordinary circumstances, but it is perhaps justifiable when only a very small quantity of seed can be obtained, and when its value is (as in the present instance) quite beyond any ordinary scale of prices.

The conclusions to be drawn from the experience of this past season confirm those of previous years. Prelude wheat can be unhesitatingly recommended as the best variety available for districts where extreme earliness is necessary and where there is a tendency toward the production of long straw. For dry districts, where straw is apt to be short, Prelude cannot be recommended. The Dominion Cerealist hopes to introduce a very early-maturing sort in the near future which, though not quite so early in ripening as Prelude, will produce somewhat longer straw. A very early-maturing wheat with decidedly long straw may perhaps be an impossibility.

The regular distribution of Prelude wheat in five-pound samples was commenced this winter. As there was on hand only a very small stock of seed, compared with the amount asked for, it was necessary to refuse most of the applications which were received, especially those from districts where the need of this particular variety was not so very great. More than 200 samples were sent out, chiefly to northern localities in what may be roughly described as the settled areas of Saskatchewan and Alberta. Provision has been made for a good acreage of Prelude on the Experimental Farms this season, so that there may be a large stock for distribution, and perhaps some seed for sale also next winter.

DISTRIBUTION OF SEED GRAIN BY MAIL.

The annual free distribution of seed grain and potatoes, which is now in progress, is being carried on in a manner similar to that of the previous year. The grain for distribution was grown chiefly on the Experimental Farms at Indian Head and Brandon. Some Ottawa seed is also being used; and the stock of potatoes has been obtained entirely from a field grown on the Central Experimental Farm under the supervision of the Dominion Botanist. In spite of the unfavourable character of the season, both the yield and quality of these potatoes were unusually good.

All grain for distribution is grown with the greatest care, so as to be free from admixture with other varieties, and after threshing it is thoroughly cleaned by the best obtainable grain-cleaning machinery and, finally, it is hand-picked if necessary to remove any remaining impurities. By these precautions we are able to send out seed of the very highest type, distinctly superior, as a rule, to the best commercial stocks. While the adoption of so high a standard makes it impossible to distribute as large amounts as in years gone by, there is no doubt of the advantages of the present system. Reasonable regulations are now being enforced so that samples of seed are only sent to those applicants whose requests give evidence of some thought. Those who have failed to send a report on a sample received in a previous season are not eligible for further samples.

In any free distribution carried on under Government auspices some dissatisfaction is sure to arise; but, considering its inherent difficulties, the claim may fairly be made that this distribution is now managed in such a way as to give general satisfaction. Undoubtedly it is proving of immense value to Canada.

The principal varieties distributed this season are as follows:—

Spring wheat.—Marquis, Red Fife, White Fife, Huron, Prelude.
Barley.—Manchurian (6-row), Canadian Thorpe (2-row).
Oats.—Banner, Abundance, Ligowo, Daubeney.
Peas.—Arthur, Golden Vine.
Potatoes.—Irish Cobbler, Gold Coin, Carman No. 1, Delaware.

MILLING AND BAKING TESTS.

A large series of milling and baking tests has been carried on during the past winter. These have included many new cross-bred varieties produced at Ottawa by the Dominion Cerealist, and some of the standard, old varieties as well. The samples tested were chiefly grown at Ottawa, last season, but samples from some of the branch Experimental Farms were included; as it is important to study the variations which occur in baking qualities when varieties of wheat are grown under different conditions.

Attention is being given to problems in connection with the making of bread, both from a baker's point of view and a housekeeper's; and the laboratory is now prepared to investigate any cases of contaminated, spoiled or suspicious flour which may be submitted.

No detailed report of the tests of this winter will be made at present, as it is intended to publish a bulletin on this subject as soon as practicable, giving an account of most of the work which has been done along these lines for several years.

EXPERIMENTS WITH VARIETIES OF GRAIN AT OTTAWA.

On the Central Experimental Farm last season there were grown four principal series of plots:—

1. Very small plots of unfixed types, produced in the second and later generations from cross-bred seeds.

2. Small propagation plots in which the new cross-bred sorts which have shown themselves to be fixed in character are increased until enough seed is available for a plot of one-sixtieth of an acre. A few named (commercial) sorts are also grown in these plots, as well as selected strains from named varieties (commercial or otherwise).

3. The regular series of plots of one-sixtieth of an acre each, in which the comparative tests of varieties are carried on.

4. Larger plots of varying size where those varieties which have given evidence of special merit are propagated on as large a scale as the limited amount of land (and sometimes of seed) permits. Seed from the best of these plots is sent to the branch Experimental Farms the following year for more extended trial.

The following figures will give an idea of the extent of this work, last season, at Ottawa:—

Very small plots of cross-bred sorts, not yet fixed	470
Small propagation plots	291
Plots of one-sixtieth of an acre	434
Larger propagation plots	45
Total plots	1,150

There were grown at Ottawa, last season, the following numbers of varieties of wheat, emmer, oats, barley, peas, rye, beans and flax:—

New cross-bred varieties, under numbers	426
Cross-bred varieties, named	38
Selected strains from commercial sorts	83
Commercial sorts, unselected	58
Total varieties and selections	605

The above figures would have been somewhat larger if there had been enough land available for the Cereal Division to make possible the sowing of all the varieties

Photo by C. E. Saunders.

Prelude Wheat "in blossom". Marquis wheat not yet in Head. Central Farm, July 2, 1912.

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which were on hand. Unfortunately a large number of barley plots had to be omitted on account of the shortage of land.

In view of the great amount of material which is being studied, it should be explained that the object in view is to test a multitude of varieties and finally to reject almost all of them, retaining, however, everything which has shown outstanding merit. To the public there will be introduced only a few of the very best sorts. The great disadvantage of introducing too many varieties for the use of the farming community is fully recognized, and any such error is being carefully guarded against. Very short lists of varieties recommended for cultivation in the different provinces are published from time to time, for the guidance of farmers.

CROSS-BREEDING AND SELECTING CEREALS AT OTTAWA.

Cross-breeding and selection have been continued as in other years. An interesting new beardless barley, called 'Arlington Awnless,' which has recently been introduced by the Department of Agriculture at Washington, furnished an opportunity of making some promising new crosses for the production of still better beardless sorts. Crosses were also made last summer between Marquis and Prelude wheats, for the purpose of combining as far as possible the splendid qualities of these two varieties. Other crosses, in wheat and oats, were effected.

The amount of material now on hand is very great, but it is felt that some new crosses should be made from time to time; so that Canada may not lose the high position she now holds by the remarkably successful efforts which have been made here for the improvement of cereals.

During the past year some changes in the staff of the Cereal Division have occurred. My assistant, Mr. H. Sirett, B.S.A., resigned his position towards the close of the summer, and took up other work which offered much better remuneration. A long delay occurred before the vacancy was filled, and the work of the Division suffered considerably. This month, however, Mr. R. Newton, B.S.A., was appointed assistant, and an effort is being made to overtake as much of the work as possible before seeding time puts an end to the winter's operations.

My thanks are due to all the members of my staff who have co-operated with me in endeavouring to push forward the work of the Division. The past season was in some respects particularly difficult, but fair progress was made nevertheless. I wish to thank my stenographer, Miss Gertrude Ker, for her good work throughout the year, and my foreman, Mr. Geo. J. Fixter, for his care in the management of the field work and the distribution of seeds, and Mr. Wm. Ellis for his reports on the germination tests of the various grains he has examined for me.

In the following pages will be found tables giving particulars in regard to the annual distribution of free samples of seed grain, vitality tests, and the plot tests of varieties at Ottawa. Short lists of recommended sorts of grain are also given, as well as other information bearing on the cultivation of cereals.

Following my own report will be found the reports on cereal work written by the Superintendents of the various branch Farms and Stations, throughout the Dominion.

I have the honour to be, sir,

Your obedient servant,

CHARLES E. SAUNDERS.

Dominion Cerealist.

DISTRIBUTION OF SAMPLES OF SEED GRAIN AND POTATOES.

The weather last season was so unfavourable for the ripening and harvesting of grain that great difficulty was experienced in securing a good supply of suitable seed for the distribution. Many applications which might otherwise have been accepted could not be filled on account of the shortage of suitable material.

The seed grain distributed was grown chiefly at Indian Head, Sask., Brandon, Man., and Ottawa, Ont.

The potatoes were grown at Ottawa under the direction of the Dominion Botanist. By using land on which potatoes had not been grown for many years, and by repeated spraying with fungicides and insecticides throughout the summer, a large crop of excellent quality was obtained.

The number of applications for samples was very large, but a considerable proportion of them could not be accepted, as they did not give the required information in regard to the conditions on the applicant's farm and his previous experiences with the kind of crop asked for. Many applications also arrived too late to be filled.

Farmers who desire to secure samples from this free distribution should apply not later than January, and preferably in December, and must give a clear statement of their needs so that a suitable variety may be sent.

Applicants for potatoes from other provinces than Ontario and Quebec are supplied from the branch Experimental Farms.

The following tables show the number of samples distributed from Ottawa:—

DISTRIBUTION—Classified by Varieties.

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
Oats—			
Banner	763	Spring Wheat—	
Thousand Dollar	300	Marquis	1,625
Daubeney	248	White Fife	356
Ligowo	59	Prelude	228
Abundance	26	Red Fife	120
		Huron	100
	1,396	Preston	69
		Bobs	1
Barley (six-row)—			
Manchurian	1,204		2,499
O.A.C. No. 21	26		
Odessa	2		
		Peas—	
		Arthur	819
		Golden Vine	501
Barley (two-row)—		Prussian Blue	3
Canadian Thorpe	42		
Hannchen	11		1,323
Invincible	1		
	1,266	Potatoes—	
		Gold Coin	1,114
Winter Rye—		Irish Cobbler	420
Mammoth White	4	Carman No. 1	202
Thousandfold	4	Delaware	28
	8		1,764

DISTRIBUTION—Classified by Provinces.

—	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.	Total.
Oats	16	67	40	655	198	53	186	140	41	1,396
Barley	7	45	24	438	128	73	329	209	33	1,286
Wheat	21	97	57	402	118	167	987	587	63	2,499
Peas	2	49	50	549	207	64	183	180	39	1,323
Rye	......	......	......	......	......	......	......	......	8	8
Potatoes	......	......	......	1,052	712	......	......	......	......	1,764
Total	46	258	171	3,096	1,363	357	1,685	1,116	184	8,276

TESTS OF VITALITY OF SEED GRAIN GROWN IN 1912 AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA, AND AT THE BRANCH EXPERIMENTAL FARMS.

The following table, prepared by Mr. Wm. T. Ellis, gives the results of the germination tests of the seed grain produced at the various Experimental Farms in 1912:—

CENTRAL EXPERIMENTAL FARM, OTTAWA.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Average Percentage of Strong Growth.	Average Percentage of Weak Growth.	Average Total Vitality.
Wheat	225	100·0	9·0	82·7	3·5	86·2
Barley	106	100·0	13·0	81·8	4·7	86·6
Oats	71	100·0	22·0	86·6	2·6	89·2
Peas	47	100·0	12·0	......	......	72·2
Rye	2	98·0	96·0	93·0	4·0	97·0
Beans	5	92·0	66·0	......	......	84·4
Flax	21	94·0	34·0	......	......	69·2
CHARLOTTETOWN, P.E.I.						
Wheat	15	90·0	41·0	67·4	2·1	69·6
Barley	18	98·0	76·0	88·5	3·3	91·8
Oats	20	95·0	73·0	80·2	3·3	83·6
Peas	2	12·0	4·0	......	......	8·0
NAPPAN, NOVA SCOTIA.						
Wheat	14	96·0	80·0	87·0	2·2	89·2
Barley	16	99·0	67·0	87·2	2·5	89·7
Oats	16	98·0	86·0	89·6	3·3	92·9

TESTS OF VITALITY OF SEED GRAIN, ETC.—*Continued.*

CAP ROUGE, QUEBEC.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Average Percentage of Strong Growth.	Average Percentage of Weak Growth.	Average Total Vitality.
Wheat	14	87.0	72·0	77·7	1·5	79·2
Barley	10	90·0	51·0	68·8	2·3	71·1
Oats	8	95·0	70·0	81·1	2·2	83·3
BRANDON, MANITOBA.						
Wheat	20	95·0	65·0	82·6	2·2	84·9
Barley	20	95·0	69·0	82·3	3·2	85·5
Oats	22	99·0	77·0	86·9	2·8	89·7
Peas	12	82·0	62·0	......	......	67·8
Flax	8	85·0	52·0	......	......	72·3
INDIAN HEAD, SASK.						
Wheat	21	99·0	91·0	94·4	1·0	95·4
Barley	20	100·0	83·0	90·4	3·9	94·3
Oats	16	100·0	84·0	91·7	2·4	94·1
Peas	12	84·0	42·0	......	......	65·5
ROSTHERN, SASK.						
Wheat	29	97·0	64·0	85·8	2·6	88·5
Barley	16	99·0	51·0	84·3	1·5	85·8
Oats	16	97·0	82·0	87·3	3·2	90·7
Peas	11	86·0	30·0	......	......	53·6
SCOTT, SASK.						
Wheat	14	99·0	85·0	89·5	2·5	92·0
Barley	9	99·0	56·0	84·1	1·4	85·5
Oats	12	97·0	78·0	87·2	2·6	89·9
Peas	7	66·0	8·0	......	......	42·5
LACOMBE, ALBERTA.						
Wheat	24	81·0	34·0	52·2	4·2	56·5
Barley	22	92·0	48·0	73·5	4·5	78·0
Oats	18	87·0	16·0	51·7	7·2	59·1
Peas	7	70·0	0·0	......	......	26·0
LETHBRIDGE, ALBERTA.						
Wheat	31	99·0	84·0	89·6	2·7	92·3
Barley	21	100·0	80·0	84·4	9·6	94·0
Oats	16	99·0	67·0	73·6	7·6	81·2
Peas	19	76·0	10·0	......	......	41·3
Buckwheat	4	100·0	67·0	......	......	84·3
FORT VERMILION, ALBERTA.						
Wheat	8	100·0	92·0	97·1	1·2	98·3
Barley	4	96·0	75·0	87·5	1·0	88·5
Oats	3	66·0	49·0	54·0	6·3	60·3
Peas	1	84·0	84·0	......	......	84·0

(Signed) WILLIAM T. ELLIS.

EXPERIMENTS WITH CEREALS, ETC., ON THE CENTRAL EXPERIMENTAL FARM, OTTAWA.

In the following tables will be found the results of the tests of varieties of grain at Ottawa in the season of 1912. The work here reported upon is carried out under the immediate supervision of the Dominion Cerealist.

WEATHER AT OTTAWA.

The spring of 1912 was rather wet, so that seeding was interrupted and delayed to a serious extent. Later on, in early summer, a succession of exceptionally hot days occurred, which injured crops somewhat, especially on any land that was easily dried out. This hot period was followed by almost continuous wet weather until about the first of October. All the grain was injured by the wet, and in some stooks a good deal of sprouting occurred. The unfavourable conditions caused a large amount of extra work and seriously lowered the yield and quality of all grain crops.

UNIFORM TEST PLOTS OF CEREALS, ETC., AT OTTAWA.

The regular test plots of grain at Ottawa are one-sixtieth of an acre each. The number of these plots during the past season was as follows:—Spring wheat 201, emmer and spelt 20, oats 55, six-row barley 88, two-row barley 1, peas 49, spring rye 3, field beans 7, flax 19, making a total of 443 plots and representing about 420 varieties and selected strains.

Owing to the shortage of land for the Cereal Division, the variety tests of winter wheat, winter rye and two-row barley had to be omitted.

The tests of field roots and fodder corn, formerly carried on in this Division, have been transferred to the Division of Forage Plants.

In the following tables a discrepancy will be observed in some cases between the figure given as the number of days maturing and that which is obtained by counting the days between the date of sowing and the date of ripening. When any varieties have been sown later than the others, it has been found necessary to introduce a correction, because, owing to the great difference between spring and midsummer temperatures, a delay of a few days in sowing does not produce a corresponding delay in ripening.

SPRING WHEAT.

The regular test plots of spring wheat were sown on April 30 to May 2, the seed being used at the rate of about one and one-half bushels to the acre. The durum wheats were sown at the rate of about one and three-quarter bushels per acre.

The following table includes only the named varieties. Those varieties which have a letter after the name are new strains propagated at Ottawa from single selected plants.

Most of the varieties under test have been bred by the Dominion Cerealist, and are without names, being recorded by numbers. As soon as the value of these new sorts has been determined, names will be given to such of them as possess sufficient merit to warrant their introduction to the public.

The yield per acre is expressed in pounds, and also in 'bushels' of sixty pounds.

The character of the straw is indicated by marks on a scale of ten points, according to the proportion of the plot standing erect at harvest time.

Named varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk (*).

The following varieties were sown on such inferior soil (suitable land not being available) that the yields obtained from them give no indication of their relative productiveness, and the figures are therefore omitted. The varieties in question are: Huron Selected, Onega A, Pringle's Champlain C, Red Fern B, Red Fern C.

SPRING WHEAT.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Early Russian*	Apr. 30	Aug. 14	106	45	6	3·5	3,000	50	—	63·0
2	Marquis*	" 30	" 14	106	42	10	3·5	2,580	43	—	61·3
3	Chelsea*	" 30	" 11	103	42	9	4·0	2,520	42	—	62·0
4	Early Red Fife*	" 30	" 14	106	45	10	3·7	2,430	40	30	62·0
5	Garton's No. 46	" 30	" 14	106	45	10	3·5	2,400	40	—	61·2
6	White Russian D*	" 30	" 17	109	50	7	4·2	2,400	40	—	62·0
7	Goose	" 30	" 14	106	44	8	2·5	2,310	38	30	60·5
8	White Russian C*	" 30	" 17	109	50	5	4·2	2,310	38	30	60·5
9	Kubanka B*	" 30	" 21	113	44	9	2·5	1,920	32	—	62·0
10	Alpha Selected*	" 30	" 11	103	40	10	3·5	1,890	31	30	59·0
11	Kubanka A*	" 30	" 21	113	44	9	2·5	1,830	30	30	61·0
12	Prelude (155 B)*	May 1	" 1	93	40	10	2·2	1,680	28	—	65·0
13	White Fife C*	Apr. 30	" 21	113	44	10	3·7	1,560	26	—	59·0
14	Bishop*	May 14	" 18	103	40	10	3·5	1,500	25	—	59·0
15	Roumanian	Apr. 30	" 22	114	48	9	2·7	1,500	25	—	62·0
16	Stanley A*	" 30	" 14	106	42	10	3·7	1,440	24	—	59·0
17	Hungar'n White B*	" 30	" 19	111	42	7	4·5	1,290	21	30	60·2
18	Red Fife H*	" 30	" 21	113	42	10	4·0	930	15	30	58·0
19	Kubanka C*	" 30	" 21	113	44	9	2·5	870	14	30	60·0
20	Preston H*	" 30	" 14	106	40	10	4·0	840	14	—	59·1
21	Red Fife M*	" 30	" 21	113	42	10	4·0	660	11	—	56·0
22	Hungar'n White D*	" 30	" 19	111	42	8	4·5	600	10	—	58·0

RECOMMENDED VARIETIES OF SPRING WHEAT.

For Ontario and Quebec.—Huron and Preston, very productive early ripening bearded wheats, giving flour of fair baking strength. Marquis and Early Red Fife, early ripening beardless sorts, giving flour of very high baking strength. Red Fife and White Fife, beardless varieties, giving flour of very high baking strength.

For the Maritime Provinces, the old varieties, Red Fife and White Fife, are excellent. If early sorts are required, Huron and Preston are among the best. Marquis also does well. White Russian is a popular variety It gives a large crop. but is rather late in ripening and is of poor quality for bread-making.

For Manitoba, Saskatchewan and Alberta.—Marquis is the best variety for most districts. Red Fife is excellent for localities where there is no danger of early frosts. For districts where extreme earliness is required and where there is sufficient rainfall to produce a good length of straw, the new variety Prelude is most highly recommended.

For British Columbia.—Preston, Huron and Stanley give large yields. Red Fife and Marquis may not generally give quite such large crops, but they are better bread-making varieties.

WINTER WHEAT.

No suitable land was available for the winter wheat plots at Ottawa in the autumn of 1911. They were therefore omitted.

RECOMMENDED VARIETIES OF WINTER WHEAT.

The climate of Ottawa being too severe for the regular production of good crops of winter wheat, the average yields obtained here would scarcely serve as a satisfactory guide for farmers in southern Ontario. Some recommendations in regard to varieties of winter wheat may, however, be given.

One of the best varieties in the field is Dawson's Golden Chaff (beardless). It has the disadvantage, however, of giving flour which is low in baking strength, and therefore suitable for crackers, cakes, etc., but not for light bread. The gluten content of this variety is not high enough to make it quite satisfactory for the production of rolled wheat and other similar cereal products, though it is used for these purposes.

Turkey Red (bearded) yields the strongest flour, but does not as a rule give, in Ontario, as large a yield of grain per acre as some of the other sorts.

Egyptian Amber (bearded) and Tasmania Red (bearded) give good yields of grain and produce very good flour for bread-making.

Imperial Amber (bearded) is another variety which can also be recommended both for its high yield and the very fair strength of its flour.

EMMER AND SPELT.

The plots of Emmer and Spelt were sown on May 3, the seed being used at the rate of about one hundred and twenty pounds (or four bushels by measure) to the acre.

Common Emmer (often incorrectly called 'Speltz') is one of the best varieties, being less coarse and containing a larger proportion of kernel than most of the other sorts.

Only the named sorts are here reported upon. Many new varieties under numbers are also being tested.

EMMER AND SPELT.—Test of Varieties.

Number.	Name of Variety.	Date of sowing.	Date of ripening.	No. of days maturing.	Average length of straw, including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Lb.
1	Red Emmer......	May 3....	Aug. 31..	120	40	10	3	3,030	36
2	White Spelt. .	" 3....	" 27.	116	46	10	5.5	2,520	25
3	Double Emmer...	" 3....	" 13..	102	34	10	2	2,460	33
4	Smooth Spelt.....	" 3....	" 27..	116	46	10	5	2,130	23.3
5	Red Spelt.......	" 3....	" 27..	116	44	10	5.2	1,980	27
6	Common Emmer..	" 3....	" 20..	109	38	10	2.2	1,920	35

OATS.

In addition to the named varieties here reported upon, twenty plots of new cross-bred sorts under numbers, were tested. These are chiefly crosses having the Chinese Naked oat as one parent. They have inherited from that variety the peculiarity of threshing out free from hull, and may prove valuable on that account.

The oat plots were sown on May 9 and 10, the seed being used at the rate of about two bushels per acre for most varieties, but in greater quantities whenever the oats were of unusually large size.

The yield per acre is expressed in pounds, and also in 'bushels' of thirty-four pounds.

Named varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.*

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
					Ins.		Ins.	Lb.	Bush.	Lb.	Lb.
1	American Beauty C*.....	May 9	Aug. 21	104	50	7	8	3,360	98	28	32
2	" " B*. ...	" 9	" 21	104	50	5	8	3,330	97	32	33
3	Abundance D*...	" 9	" 22	105	50	10	9	3,180	93	18	33
4	Abundance, Garton's Regenerated...	" 9	" 22	105	50	8	9	3,000	88	8	35
5	Gold Rain...............	" 9	" 18	101	48	7	8	3,000	88	8	34
6	Bergs.............. .	" 9	" 17	100	48	10	7·5	2,940	86	16	31
7	Excelsior................	" 9	" 16	99	42	10	7	2,850	83	28	32
8	Swedish Select	" 9	" 16	99	48	10	8	2,820	82	32	30
9	Abundance A*......... .	" 9	" 22	105	50	10	9	2,790	82	2	31
10	Green Mountain..........	" 9	" 23	106	52	6	10	2,730	80	10	31
11	Irish Victor...............	" 9	" 19	102	48	8	8	2,730	80	10	32
12	Siberian.........	" 9	" 20	103	48	8	8	2,700	79	14	33
13	Thousand Dollar.........	" 0	" 18	101	48	5	8·5	2,640	77	22	35
14	Improved American......	" 9	" 19	102	45	10	7	2,580	75	30	29·2
15	Tartar King.	" 9	" 16	99	44	10	8	2,520	74	4	31
16	Victory.	" 9	" 23	106	50	8	8	2,520	74	4	33
17	Ligowo, Swedish........	" 9	" 16	99	40	10	8	2,490	73	8	33
18	Banner L*.....	" 9	" 17	100	40	10	7·5	2,400	70	20	29
19	Twentieth Century. .. .	" 9	" 21	104	50	8	8	2,280	67	2	32
20	Banner K*.....	" 9	" 17	100	40	10	7·5	2,250	66	6	30
21	Alpine............. ...	" 9	" 17	100	58	7	8·5	2,220	65	10	32
22	Pioneer.................	" 9	" 16	99	42	10	8	1,950	57	12	35
23	Banner M*	" 9	" 17	100	40	10	7·5	1,920	56	16	32
24	Banner J*..............	" 9	" 17	100	40	10	7·5	1,830	53	28	31·5
25	Swedish Black..... ...	" 9	" 6	89	50	8	9	1,710	50	10	31
26	Daubeney Selected*.. ...	" 9	" 4	87	32	10	7	1,680	49	14	31
27	Banner B*...	" 9	" 17	100	40	10	7·5	1,590	46	26	31
28	Early Ripe G*..........	" 9	" 3	86	38	9	6	1,590	46	26	27
29	Black Mesdag......... ...	" 9	" 4	87	32	10	7·5	1,470	43	8	34·5
30	Danish Island..........	" 9	" 19	1 2	38	10	7·5	1,440	42	12	29
31	Eighty Day*............	" 9	" 1	84	37	10	6·5	1,380	40	20	32
32	Early Blonde......... ...	" 9	" 23	106	42	9	8	1,350	39	24	27
33	Early Ripe E*..........	" 9	" 3	86	38	10	6	1,110	32	22	31
34	Early Ripe F*..........	" 9	" 3	86	38	9	6	1,050	30	30	28

RECOMMENDED VARIETIES OF OATS.

Among the most productive varieties of white oats, Banner is especially recommended. Abundance is another excellent sort. Ligowo is somewhat earlier in ripening but does not generally give quite so large a yield as Banner or Abundance. Gold Rain is a very productive yellow oat. Black oats are not recommended, but Pioneer and Excelsior may be mentioned as two of the best varieties.

Farmers who require an extremely early-ripening variety should try Eighty Day, Orloff, or Sixty Day. The name Sixty Day is misleading, as this oat is not earlier than the other two. Somewhat less early, but probably more satisfactory, as a rule, are Daubeney and Tartar King. The latter is a very coarse variety.

SIX-ROW BARLEY.

The plots were sown on May 8 and 9, the seed being used at the rate of about two bushels to the acre. The land on which it was necessary to place the plots varied somewhat in character, so that the yields given in the following table are not very trustworthy for purposes of comparison.

The yield per acre is expressed in pounds, and also in 'bushels' of forty-eight pounds.

Only the named varieties and selections are reported on. Many new cross-bred beardless and hulless sorts, produced by the Dominion Cerealist were also tested.

Named varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.*

Six-row Barley.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, Including Head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Odessa D*.........	May 9..	Aug. 6	92	40	10	3·5	2,310	48	6	43·3
2	Odessa F*..........	" 9..	" 6	92	40	9	3·5	2,280	47	24	45
3	Stella C*.....	" 9..	" 6	92	38	10	3·2	2,250	46	42	46
4	Stella G*...... ...	" 9..	" 6	92	38	9	3·2	2,220	46	12	46
5	Taganrog A*.......	" 9..	" 6	92	34	9	3	2,160	45	—	44·3
6	Triumph.........	" 9..	" 19	105	38	10	3·2	2,160	45	—	40·2
7	Manchurian G*....	" 8..	" 6	93	30	10	3·5	2,130	44	18	43·3
8	Stella A*....	" 9..	" 6	92	38	8	3·2	2,130	44	18	48
9	Manchurian A*....	" 8..	" 6	93	30	8	3·5	1,950	40	30	43
10	Success B*.........	" 9..	July 24	79	41	7	3	1,950	40	30	38
11	Odessa C*..........	" 9..	Aug. 6	92	35	10	3·5	1,890	39	18	42
12	Escourgeon........	" 8..	" 5	92	34	9	3	1,860	38	36	45·3
13	Manchurian H*....	" 8..	" 6	93	32	9	3·5	1,860	38	36	46·3
14	Black Japan......	" 8..	" 5	92	26	10	2·5	1,710	35	30	45·3
15	Albert*...........	" 8..	" 6	93	32	10	3·5	1,650	34	18	46
16	Guy Mayle........	" 8..	July 30	86	28	8	2·5	1,440	30	—	61·3
17	Oderbruch........	" 9..	Aug. 9	95	30	10	2·7	1,440	30	—	45
18	Nugent*...........	" 9..	" 9	95	30	10	3	1,299	26	42	44·5
19	O.A.C. No. 21....	" 8..	" 9	96	28	10	2·7	1,290	26	42	44·3
20	Blue Short Head A*	" 8..	" 19	106	22	10	2	1,080	22	24	42·3
21	Blue Short Head C*	" 8..	" 19	106	22	10	2	1,050	21	42	40
22	Early Indian*......	" 8..	July 20	76	26	10	1·7	690	14	18	41

RECOMMENDED VARIETIES OF SIX-ROW BARLEY.

Among the most productive six-row barleys are Manchurian and Odessa. Manchurian is a selection from Mensury. Ontario Agricultural College No. 21 is also a very good selection, similar in character to Manchurian.

The beardless (or 'hooded') types of barley at present available in commerce are not very satisfactory. Success and Champion are two of the best kinds. They are both early in ripening; but their straw is not very strong, and they generally give rather a small yield.

The common sorts of hulless barley are Hulless White (beardless) and Hulless Black (bearded). These are characterized by weak straw.

It is expected that some of the new cross-bred beardless and hulless types will prove more satisfactory than any of the older varieties. These will be introduced as soon as they have been thoroughly studied.

TWO-ROW BARLEY.

It was not possible to sow the plots of two-row barley in 1912, as the land allotted to the use of the Cereal Division is insufficient.

RECOMMENDED VARIETIES OF TWO-ROW BARLEY.

Among the best sorts are Duckbill, Canadian Thorpe, Standwell, Swan's Neck, Hannchen and the different strains of Chevalier.

FIELD PEAS.

The plots of peas were sown May 20 and 21, the seed being used at the rate of two or three bushels to the acre, according to the size of the pea.

The very wet weather was favourable for the development of fungous diseases among the peas. The results of the season are very unsatisfactory. The following varieties were so badly diseased that they gave scarcely any crop at all: Black-eye Marrowfat, Golden Vine, Mackay. Only the named varieties are reported on. Many new cross-bred sorts under numbers were also grown.

The yield per acre is expressed in pounds and also in 'bushels' of sixty pounds.

Named varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.*

PEAS—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured Bushel after cleaning
						In.	In.	Lb.	Bus.	Lb.	Lb.
1	Solo............ .	Large...	May 20	Sept. 8	111	60	2·2	1,830	30	30	61
2	Picton *...........	Medium	" 20	" 5	108	50	2·2	1,440	24	..	61·6
3	English Grey......	" ..	" 20	" 10	113	72	2·2	1,290	21	30	53
4	White Marrowfat..	Large ..	" 20	" 8	111	70	2·2	990	16	30	64
5	Prussian Blue	Medium	" 20	" 10	113	75	2·2	960	16	..	61·5
6	Chancellor.........	Small ..	" 20	" 5	108	72	2	930	15	30	62·4
7	Wisconsin Blue....	Medium	" 20	" 10	113	56	2	870	14	30	62·4
8	Prince *...	Large ..	" 20	" 8	111	50	2	840	14	..	63
9	Daniel O'Rourke...	Small .	" 20	" 10	113	75	2	720	12	..	61
10	Arthur Selected *..	Medium	" 20	" 3	106	48	2·2	690	11	30	63·3
11	Paragon*..........	" ..	" 20	" 10	113	72	2·5	690	11	30	64

RECOMMENDED VARIETIES OF PEAS.

Prussian Blue, Arthur and Chancellor are among the most productive sorts, and are also early in ripening. The Marrowfat varieties and Golden Vine are somewhat later in maturing. Most of these varieties can be obtained from seedsmen in Canada.

Arthur is particularly desirable on account of its high yield and earliness in maturing.

SPRING RYE.

The plots of spring rye were sown on May 3, the seed being used at the rate of about one and one-half bushels to the acre.

The yield per acre is expressed in pounds and also in 'bushels' of fifty-six pounds.

SPRING RYE.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of ripening	Number of days Maturing.	Average length of Straw, including Head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per Acre.	Yield of grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bus.	Lb.	Lb.
1	Ottawa Select......	May 3..	Aug. 14	103	60	3	3·3	2,610	46	34	58
2	Common...........	May 3..	Aug. 14	103	60	3	3 3	2,370	42	18	57.3

WINTER RYE.

No plots of winter rye could be sown in the autumn of 1911, as there was no land available for the purpose.

FIELD BEANS.

Seven plots of beans, one-sixtieth of an acre each, were sown on May 23. All of the varieties sown were selected strains of field beans or of early-maturing garden sorts which may prove useful in localities where it is desired to obtain ripe seed in a short season.

Two of the varieties which have been tested for several years, Marrowfat and White Field, failed to ripen. As these varieties have proved too late for the climate of Ottawa in previous seasons their cultivation has been discontinued.

The varieties here reported upon were all sown in rows 16 inches apart.

The yield per acre is expressed in pounds and also in 'bushels' of sixty pounds.

FIELD BEANS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of ripening	Number of Days Maturing.	Average length of Plants.	Average length of Pod.	Yield of Seed per Acre.	Yield of Seed per Acre.		Weight per measured bushel after cleaning.
					Inches.	Inches.	Lb.	Bus.	Lb.	Lb.
1	Norwegian Brown Selected....	May 23.	Aug. 27	96	12	5·0	3,270	54	30	61·9
2	Golden Wax Selected.........	"	Sept. 12	112	12	3·5	2,820	47	..	65·0
3	California Pea Selected.	"	" 23	123	18	4·5	2,370	39	30	64·6
4	Stringless Kidney WaxSelected	"	" 10	110	14	4·0	1.950	32	30	60·0
5	Challenge Black Wax Selected.	"	Aug. 27	96	12	3·5	1,500	25	..	57·5

FLAX.

Eighteen selected strains from various commercial sorts of flax were grown in sixtieth-acre plots. The seed was sown on May 25 at the rate of 60 pounds to the acre.

The very wet weather of August and September was unfavourable for the flax, and made the yields from the plots irregular and unsatisfactory.

The yield of seed per acre is expressed in pounds and also in 'bushels' of fifty-six pounds.

FLAX.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Plants.	Yield of seed per Acre.	Yield of seed per Acre.		Weight per measured bushel after cleaning.
					Inches.	Lb.	Bush.	Lb.	Lb.
1	Novarossick B......	May 25..	Aug. 27..	94	22	1,410	25	10	46·3
2	La Plata C.........	" 25..	" 27..	94	18	1,080	19	16	49·3
3	Russian A..........	" 25..	" 19..	86	30	1,020	18	12	50
4	La Plata A.........	" 25..	" 27..	94	25	930	16	34	49
5	La Plata B....... ..	" 25 .	" 27..	94	18	870	15	30	52·3
6	Yellow Seed C......	" 25..	Sept. 5..	103	30	840	15	..	50·5
7	Common D	" 25..	Aug. 19.	86	24	810	14	26	53·5
8	White Flowering A.	" 25..	" 19..	86	24	810	14	26	51·5
9	White Flowering B.	" 25..	" 19..	86	24	810	14	26	55·3
10	Riga C.............	" 25..	" 19..	86	28	690	12	18	48·3
11	Yellow Seed A.	" 25..	Sept. 5..	103	30	690	12	18	51
12	Yellow Seed B......	" 25..	" 5..	103	30	690	12	18	51·3
13	Common S..........	" 25..	Aug. 19.	86	32	630	11	14	48
14	Riga B	" 25..	" 19..	86	28	600	10	40	49
15	Common C..........	" 25..	" 19..	86	30	510	9	6	49·3
16	Russian B.........	" 25..	" 19..	86	34	510	9	6	45
17	Common B.....	" 25..	" 19..	86	30	360	6	24	49
18	Common A.........	" 25..	" 19..	86	30	270	4	46	44·3

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

J. A. CLARK, B.S.A., Superintendent.

The uniform test plots of wheat and oats were sown in duplicate on May 15 and 16, 1912, on land broken the previous autumn for the first time since possession was taken of this property. The land was a sandy loam which had been manured on the sod with barnyard manure at the rate of eight tons per acre during the summer of 1911, immediately after a crop of timothy hay had been removed. The soil was far from uniform. The plots and paths were seeded down with a mixture of 10 pounds common red clover, 3 pounds Alsike, and 1 pound of White Dutch per acre. An immense growth of clover, that at harvest stood to the bands of the sheaves, must have reduced the yield of grain. The clover on the paths was cut for hay in July.

EXPERIMENTS WITH SPRING WHEAT.

The average of the duplicate plots for the season of 1912 is here given, except Marquis and Red Fife. The seed for the plot of Early Red Fife was grown at Ottawa, and that for the extra plot of Marquis was grown at Indian Head. The other plots of named varieties were sown with seed grown in 1911 at this Station.

Three new varieties under numbers were also tested, the seed having been grown at Ottawa.

SPRING WHEAT.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Marquis	May 15.	Aug. 21	98	37	10	3	1,522	25	22	62.2
2	Stanley	" 15.	Sept. 2	110	32	10	2¾	1,501	25	1	59
3	Huron	" 15.	Aug. 26	103	36	10	3	1,395	23	5	61·1
4	Chelsea	" 15.	" 22	99	34	10	3¼	1,276	21	16	61
5	White Fife C.S.G.A	" 15.	Sept. 3	111	36	10	3	1,265	21	5	
6	White Russian	" 15.	" 3	111	39	10	4	1,222	20	21	60
7	White Fife (Ottawa)	" 15.	" 3	111	37½	10	4	1,208	20	8	60
8	Goose (J. Lapp)	" 15.	" 17	125	41	10	2	1,119	18	39	60·4
9	Marquis (extra plot for chemist)	" 15.	Aug. 21	98	37	10	3	1,108	18	28	62·2
10	Early Red Fife	" 15.	" 24	101	36½	10	2¾	1,093	18	13	57·9
11	Red Fife	" 15.	Sept. 3	111	32	10	2¾	1,069	17	49	60·4

EXPERIMENTS WITH OATS.

The cold backward weather that followed the sowing of the oats gave them a set-back. In June they suffered for want of moisture and then were nearly drowned out by the excessive rains in July. Oats sown the first week in June on adjoining lands gave heavier yields, which shows the unusual conditions which prevailed during the growing season.

The average of the duplicate plots is here given. The seed used was grown on this station in 1911, except one plot, Old Island Black.

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Thousand Dollar...	May 16	Aug. 28	104	44	10	7	2,349	69	3	37·1
2	Twentieth Century.	" 16	" 28	104	44	10	8	2,153	63	11	37·3
3	Siberian...........	" 15	Sept. 10	118	40	10	8⅝	2,030	59	24	38·7
4	Gold Rain	" 15	Aug. 28	105	45	10	8	1,949	57	11	37·3
5	Lincoln............	" 15	Sept. 5	113	43	10	8	1,949	57	11	37·1
6	Victory....	" 16	Sept. 10	117	46	10	8	1,949	57	11	40·5
7	Swedish Select.....	" 15	Aug. 31	108	42	10	7¾	1,940	57	2	37·1
8	Pioneer (black). ...	" 15	Aug. 24	101	37½	10	7	1,870	55	1	36·2
9	Abundance (Garton's Regenerated)	" 15	Aug. 28	105	42	10	8	1,664	48	32	36·5
10	Banner (T. Waugh)	" 15	Sept. 3	111	40	10	8	1,644	48	12	36·1
11	Old Island Black...	" 16	Aug. 24	100	48	10	10	1,638	48	6	35·9
12	Early Blossom.	" 16	Sept. 2	109	36	10	6¾	1,601	47	3	39·1
13	Norway	" 16	" 2	109	43½	10	7¾	1,579	46	16	35·4
14	Ligowo, Swedish (No. 24).........	" 15	Aug. 26	103	38	10	7	1,559	45	29	36·0
15	Daubeney........ .	" 15	" 15	92	37½	10	7	1,220	35	30	32·4

EXPERIMENTS WITH BARLEY.

Experiments were conducted in duplicate with 16 varieties of barley (8 six-row and 8 two-row) in plots of one-sixtieth of an acre each. They were sown on land that had been in turnips the previous year without any further fertilizing. The plots of six-row barley were sown on May 31 and the two-row on June 1. These plots, with the exception of a few damp places, were on land somewhat more uniform in character than the wheat and oat plots. A mixture of 8 pounds common red clover, 3 pounds Alsike, 1 pound White Dutch and 10 pounds timothy seed per acre was sown on the plots and paths. The grass on all the paths about the plots was allowed to grow. It was cut in July.

The average of the duplicate plots is here given except for Albert, Nugent, Beaver and Clifford. One plot of each of these was injured by damp places in the plots.

SIX-ROW BARLEY.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Oderbruch.....	May 31.	Sept. 5.	98	38	10	3	3,262	67	46	46.0
2	Manchurian. ..	" 31.	" 4.	97	40½	10	3	3,214	66	46	45.0
3	O.A.C. No. 21..	" 31.	" 4.	97	39	10	2¾	3,200	66	32	46.8
4	Odessa	" 31.	" 4.	97	41	10	3	3,136	65	16	44.0
5	Trooper........	" 31.	Aug. 31.	93	43	10	2¾	3,065	63	41	46.3
6	Stella..........	" 31.	Sept. 4.	97	39½	10	2¾	2,899	60	4	46 6
7	Nugent........	" 31.	" 4.	97	41	10	3	2,600	54	8	44.0
8	Albert.	" 31.	" 5.	98	40	10	3	2,468	51	20	44.5

Two-row Barley.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	English Chevalier..........	June 1	Sept. 10	102	37	10	3½	3,260	67	44	52.6
2	Swedish Chevalier.	" 1	" 10	92	36	10	3½	3,202	66	34	51.5
3	Hannchen. ...	" 1	" 5	97	36	10	2¾	2,992	62	16	52.7
4	Canadian Thorpe..	" 1	" 4	96	41	10	2¾	2,954	61	26	50.6
5	Standwell.	" 1	Aug. 31.	92	44	10	3¼	2,757	57	21	52.2
6	Invincible.....	" 1	Sept. 10	102	42	10	3	2,542	52	46	52.9
7	Clifford........	" 1	Aug. 31	92	44	10	3	2,352	49	—	52.1
8	Beaver........	" 1	" 31	92	48	10	4¼	2,220	46	12	49.1

EXPERIMENTS WITH PEAS.

Ten varieties of peas were sown, at the rate of about 2 bushels per acre, in duplicate, on one-sixtieth acre plots, on June 1. The wet season caused the peas, with the exception of the Arthur, to bloom very late into the autumn. On September 14 they were cut, and before they were dry enough to bunch a gale of wind rolled them every way, mixing all but the Arthur into one another so that the yields could not be ascertained.

Peas.—Test of varieties.

Number.	Name of Variety.	Size of Pea.	Date of sowing.	Date of ripening.	Number of days maturing.	Average length of straw.	Average length of pod.	Yield of grain per acre.	Yield of grain per acre.		Weight per measured bushel after cleaning.
						Inches.	Inches.	Lb.	Bush.	Lb.	Lb.
	Arthur Selected....	Large ..	June 1	Sept. 14	106	70	2¼	945	15	45	61·1
	Black-eye Marrowfat..............	Medium	" 1	....	....	85	2½	....	....		
	Chancellor..........	Small ..	" 1	....	....	81	2	....	....		
	English Grey.	Large ..	" 1	....	....	100	2½	....	....		
	Golden Vine.......	Small ..	" 1	....	....	85	2½	....	....		
	Paragon...........	Medium	" 1	....	....	90	2½	....	....		
	Picton....	"	" 1	....	....	72	2¼	....	....		
	Prince	"	" 1	....	....	82	2½	....	....		
	Prussian Blue......	"	" 1	....	....	90	2	....	....		
	White Marrowfat..	Large..	" 1	....	....	90	2¼	....	....		

CO-OPERATIVE TESTS OF OATS.

In order to get accurate information regarding the suitability of different varieties of oats to different localities in the province, three representatives of the leading types of oats, namely, Banner, Ligowo and Old Island Black were tested in duplicate on one-sixtieth acre plots on farms in the eastern section of the province. Seven men undertook to conduct these tests for five years, under the direct supervision of Mr. Garnet LeLacheur, seed inspector, who gave the work very careful attention and who furnished me with many valuable notes. The best seed obtainable was supplied to these men, 1 pound 6¾ ounces for each plot. The grain was threshed and weighed at the Experimental Station. The farmer was asked to sow plots of the oats he had been growing alongside, for a check.

OATS.—Co-operative Experiments in Kings and Queens Counties.

Number.	Name of Farmer.	Post Office.	County.	Variety. Banner. Bush.	Banner. Lb.	O. I. Black. Bush.	O. I. Black. Lb.	Ligowo. Bush.	Ligowo. Lb.	Check. Bush.	Check. Lb.	Name.	Average by Farms. Bush.	Average by Farms. Lb.
1	Owen Sullivan ..	Vernon	Queens.	72	4	68	1	62	3	56	21	Egyptian.....	64	24
2	James Simpson...	Bay View..	Queens.	60	9	46	15	47	22	Record lost.		Tartarian	51	15
3	Robert Furness..	Vernon.....	Queens.	58	4	58	21	50	8	52	24	Garton's Abundance...	54	31
4	Vernon Shaw.....	Montague .	Kings..	53	22	45	30	38	26	47	33	Danish Island.	46	19
5	M. A. Stewart....	Belle River.	Kings..	51	7	37	24	43	17	39	22	Joanette	43	..
6	Edgar Geddings..	Abney.....	Kings..	38	28	38	15	38	22	31	28	Wide Awake.	36	31
7	A. E. Simpson....	Bristol . . .	Kings..	Plots destroyed by hail Aug. 6, 1912.										
	Average of plots harvested..............			55	24	49	6	46	27	45	26			
	Average of the 36 plots from seed sent out.........												50	19
	Grand average..........												49	20

Mr. A. E. Simpson's plots at Bristol were so badly damaged by hail that it was impossible to do anything with them, as fully one-half of the grain was threshed when in the milk stage. I examined them carefully after the storm and noted that Old Island Black was the worst down but the least threshed. The Banner had apparently led in these plots. From the above returns we can say that Banner oats, from apparently the poorest sample of seed, has led for 1912. Old Island Black, though a little weak in the straw, came second. Ligowo in three instances was higher than the check, and in the other three was below the check.

The area of land available for multiplying pure seed is limited at this Station; however, thirteen lots of oats and two lots of wheat were sold at current prices. A blank form was sent to each applicant, asking him to agree to make a 3-year test of the variety sent with the variety that he had been growing previously on his farm. The replies received, when averaged up after a few years, will provide valuable information.

EXPERIMENTAL FARM, NAPPAN, N.S.

R. ROBERTSON, SUPERINTENDENT.

EXPERIMENTS WITH SPRING WHEAT.

Eleven varieties of spring wheat were sown in uniform test plots of one-fortieth acre each, the land being a heavy clay loam on which roots had been grown the previous year, and manure applied. This was ploughed in the fall of 1911, well worked up in the following spring and sown May 13 at the rate of 1¾ bushels per acre; 10 pounds clover and 12 pounds timothy seed per acre were also sown with this crop.

The following were the yields obtained from the named varieties. Three new sorts, under numbers, were also tested.

SPRING WHEAT.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Straw, including Head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Huron	May 13.	Sept. 9.	119	44	10	3	2,160	36	–	61
2	Red Fife	" 13.	" 12.	122	42	10	3	1,880	31	20	59
3	White Fife	" 13.	" 12.	122	41	10	3·5	1,840	30	40	60
4	Early Red Fife	" 13.	" 12.	122	46	10	3·2	1,560	26	–	60
5	Marquis	" 13.	" 10	120	40	10	3	1,480	24	40	60
6	Bobs	" 13.	" 5.	115	36	10	3	1,400	23	20	60
7	Stanley	" 13.	" 10.	120	42	10	3·5	1,300	21	40	60
8	Bishop	" 13.	" 5.	115	40	10	3	1,200	20	–	60

FIELD CROPS OF WHEAT.

Three varieties of spring wheat were grown in half-acre lots.

The land was similar to and received the same treatment as that which was devoted to the test plots. These field plots were sown May 15 and 16.

The following yields were obtained: White Fife, 23 bushels 14 pounds; Huron, 19 bushels; Red Fife, 17 bushels 30 pounds per acre.

EXPERIMENTS WITH OATS.

Twelve varieties of oats were sown in uniform test plots of one-fortieth acre each, the land being a heavy clay loam on which roots had been grown the previous year, and manure applied for that crop. They were sown on May 15, at the rate of two to two and a half bushels per acre; 10 pounds clover and 12 pounds timothy per acre were sown with this crop.

The following were the yields obtained:—

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured bushel after Cleaning.
					Inches.		Inches.	Lb.	Bus.	Lb.	Lb.
1	Danish Island......	May 15	Aug. 30	107	42	4	7·5	3,320	97	22	35·5
2	Swedish Select....	" 15	Sept. 3	111	44	5	8	3,240	95	10	35·5
3	Gold Rain.........	" 15	Aug. 31	108	44	4	7·5	3,200	94	4	36
4	Thousand Dollar...	" 15	Sept. 3	111	45	9	8	3,146	92	18	35·5
5	Banner	" 15	Aug. 30	107	44	5	8	3,120	91	26	35
6	Twentieth Century.	" 15	Sept. 3	111	44	6	8	3,080	90	20	35
7	Victory...........	" 15	Aug. 31	108	44	8	7 5	3,040	89	14	40
8	Abundance (Garton's Regenerated)	" 15	" 30	107	43	5	7	2,960	87	2	35·5
9	Lincoln............	" 15	" 31	108	44	2	8	2,920	85	30	34
10	Pioneer............	" 15	" 28	105	46	6	8	2,900	85	10	38
11	Ligowo............	" 15	Sept. 2	110	45	3	7	2,880	84	24	35
12	Siberian..........	" 15	Aug. 31	108	45	8	8	2,800	82	12	34

EXPERIMENTS WITH BARLEY.

Twelve varieties of barley, six each of two-row and six-row, were sown in uniform test plots of one-fortieth acre each, the land being a heavy clay loam on which roots had been grown the previous year, and manure applied for that crop. This was ploughed in the fall of 1911 and well worked up in the spring and was sown May 15, at the rate of two bushels per acre: 10 pounds clover and 12 pounds timothy seed per acre were also sown with this crop.

The following were the yields obtained:—

BARLEY, SIX-ROW.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	O. A. C. No. 21.. .	May 15	Aug. 28	105	36	8	2·7	2,840	59	8	48
2	Oderbruch.........	" 15	" 26	103	35	5	2·7	2,760	57	24	48
3	Nugent	" 15	" 28	105	39	3	3·0	2,560	53	16	49
4	Odessa	" 15	" 26	103	35	5	2·5	2,320	48	16	48 5
5	Stella..............	" 15	" 30	107	35	10	2·5	2,240	46	32	49
6	Manchurian	" 15	" 28	105	37	6	3·2	1,920	40	—	46

BARLEY, TWO-ROW.—Test of Varieties.

1	French Chevalier ..	May 15.	Aug. 29	106	34	3	4	3,000	62	24	51
2	Swedish Chevalier .	" 15.	" 29	106	35	5	4	2,960	61	32	50
3	Hannchen....	" 15.	" 30	107	35	2	3·2	2,760	57	24	49
4	Beaver	" 15.	" 29	106	37	6	3·5	2,120	44	8	50
5	Canadian Thorpe ..	" 15.	" 29	106	36	10	2·7	2,040	42	24	48
6	Invincible.........	" 15.	" 31	108	42	10	3	2,000	41	32	49

EXPERIMENTS WITH PEAS.

Ten varieties of peas were sown in uniform plots of one-fortieth acre each. The land was in a fair state of fertility, having been in corn the previous year. They were sown on June 5, at the rate of one and one-half to two bushels per acre, according to the size of the pea. Owing to continued wet weather this crop was not harvested until September 24, and was almost a failure, some of the plots being so badly damaged that we could not get seed from them.

The following yields were obtained:—

PEAS.—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Sowing.		Date of Ripening.		No. of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre		Weight per measured bushel after cleaning.
								Inches.	Inches.	Lb.	Bush.	Lb.	Lb.
1	White Marrowfat..	Large...	June	5	Sept.	24	111	38	3	1,040	17	20	59
2	Arthur, Selected...	Medium	"	5	"	20	107	34	2·5	1,000	16	40	60
3	Chancellor	Small	"	5	"	20	107	35	2	880	14	40	60
4	Picton.............	Medium	"	5	"	22	109	36	2·5	800	13	20	60
5	Mackay	" ..	"	5	"	22	109	36	2·5	680	11	20	57·5
6	Prussian Blue......	" ..	"	5	"	20	107	36	2·5	560	9	20	60
7	Daniel O'Rourke...	Small ..	"	5	"	20	107	34	2	540	9	..	60
8	English Grey.....	Medium	"	5	"	20	107	36	2·5	520	8	40	59
9	Golden Vine.......	Small ..	"	5	"	20	107	38	2	480	8	.	60
10	Prince	Medium	"	5	"	22	109	37	2·5	440	7	20	58

EXPERIMENTS WITH BUCKWHEAT.

Five varieties of buckwheat were sown in uniform test plots of one-fortieth of an acre each. The land was a clay loam, on which roots had been grown the previous year, and on which manure had been applied at the rate of 20 tons per acre.

The following yields were obtained:—

BUCKWHEAT.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.		Date of Ripening.		No. of Days Maturing.	Average Length of Straw, including Head.	Strength of straw on a scale of 10 points.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
							Inches.		Lb.	Bush.	Lb.	Lb.
1	Tartarian.............	June	5	Sept.	4	91	40	5	2,280	47	24	50
2	Japanese.	"	5	"	4	91	36	10	2,200	45	40	48
3	Rye.......	"	5	"	4	91	38	5	2,120	44	8	51
4	Silverhull............	"	5	"	2	89	42	5	2,040	42	24	50
5	Grey....	"	5	"	2	89	40	7	2,000	41	32	49

EXPERIMENTAL STATION, CAP ROUGE, QUEBEC.

GUS. A. LANGELIER, SUPERINTENDENT.

CEREALS.

There were fourteen varieties of wheat, eleven of peas, six of 2-row barley, seven of 6-row barley and eleven of oats under test. There were also five plots of oats and barley mixed.

The season was one of the worst, if not the worst, for the last twenty-five years. It rained on fourteen different days from May 7 to 31, and on thirteen from June 1 to 18. Nothing was sown in the test plots until this latter date, which was followed by a drought lasting until the end of July. It is no wonder that the yields were very low and that some varieties did not mature. The peas were so seriously injured by insects that no crop was obtained.

All the test plots were of one-sixtieth acre. There are paths, four feet wide, between plots, and alleys of eighteen feet between ranges.

A permanent location was chosen for the test plots. The area is divided in three equal parts, on one of which Indian corn and field roots will be grown, whilst cereals come on the next, and clover on the last. Thus, a three-year rotation will be followed. The piece of ground chosen for the test of varieties is the most uniform on the farm, though of a poor quality. There are seventy-eight plots available for cereals.

SPRING WHEAT.

Ten named varieties were grown, and four new sorts under numbers. Only the named varieties are here reported on.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average length of straw including head.	Strength of straw on scale of 10 points.	Average length of head.	Yield of Grain per Acre.	Yield of Grain Per Acre.
					Ins.		Ins.	Lb.	Bush.
1	Preston	June 18	Oct. 2	106	27.5	8	2.5	720	12
2	Marquis	" 18	" 8	112	27.7	10	2.7	660	11
3	White Fife	" 18	" 16	120	30.7	10	2.7	660	11
4	Bishop	" 18	" 2	106	30.5	7	2.5	600	10
5	Huron	" 18	" 8	112	25	5	2	540	9
6	Yellow Cross	" 18	Sept. 23	97	19.7	5	1.7	480	8
7	Red Fife	" 18	Oct. 16	120	25.5	7	2.5	420	7
8	Bobs	" 18	" 2	106	24 5	10	2.5	360	6
9	Early Red Fife	" 18	" 8	112	26.5	7	2.5	360	6
10	Alpha Selected	" 18	" 8	112	25.7	5	1.7	360	6

OATS.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per acre.	Yield of Grain per Acre.		Smut.
					Inches.		Inches.	Lb.	Bush.	Lb.	
1	Garton's Abund'nce	June 18.	Oct. 16..	120	43	10	7	1,680	49	14	Very little
2	Gold Rain.	" 18.	" 16.	120	48	10	6	1,620	47	22	Much.
3	Ligowo, Swedish...	" 18.	" 16.	120	46	10	7	1,020	30	..	"
4	Thousand Dollar...	" 18.	" 16.	120	42	10	6	1,020	30	..	"
5	Twentieth Century.	" 18.	" 16.	120	40	9	6	1,020	30	..	"
6	Eighty Day.	" 18.	Sept. 26.	100	29·5	10	4·5	960	28	8	None.
7	Siberian.	" 18.	Oct. 16.	120	44	9	7	960	28	8	Much.
8	Daubeney..........	" 18.	" 2..	106	35	10	5	840	24	24	Very little
9	Banner	" 18.	Did not								
10	Banner (from general crop)........	" 18.	ripen..	......	44	9	6	....	....		Much.
			" " ..	......	44	9	6	....	....		"
11	Victory............	" 18.	" " ..	......	42	10	6	....	....		"
12	Clydesdale.........	" 18.	" " ..	......	41	9	6	....	....		Very little

SIX-ROW BARLEY.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of grain per acre.	
					inches.		inches.	Lb.	Bush.	Lb.
1	Stella.......... ...	June 18	Sept. 26	100	27.5	10	2.5	1,200	25	..
2	Odessa....	" 18	" 26	100	27	10	2	1,200	25	..
3	Success............	" 18	" 17	91	26.7	10	2.7	1.080	22	24
4	Manchurian.	" 18	" 26	100	24.2	10	2.2	1,020	21	12
5	O.A.C. No. 21.....	" 18	" 23	97	22	10	2	900	18	36
6	Escourgeon........	" 18	Oct. 2	106	24.5	10	2 5	900	18	36
7	Black Japan.......	" 18	Sept. 23	97	16	10	2	600	12	24

TWO-ROW BARLEY.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Yield of Grain per Acre.		Remarks.
					inches.		inches.	Lb.	Bush.	Lb.	
1	Early Chevalier ...	June 18	Sept. 26	100	27	10	3	1,380	28	36	
2	Hannchen.........	" 18	Oct. 16	120	28	10	3	600	12	24	1-10 green
3	Swan's Neck......	" 18	" 16	120	33	10	3	420	8	36	1-10 green
4	Beaver	" 18	Did not ripen	....	30	10	3	......	....		
5	Duckbill..........	" 18	" " ..	....	29	10	4	......	....		
6	Swedish Chevalier.	" 18	" " ..	....	27.5	9	2.5	......	....		

PEAS.

Number.	Name of Variety.	Size of Pea.	Date of sowing.	Date of ripening.	Number of days maturing.	Average length of straw.	Average length of pod.
						Inches.	Inches.
1	Chancellor....	Small	June 18..	Oct. 8..	112	25·5	1·5
2	Golden Vine....	"	" 18..	" 8..	112	22	
3	Prussian Blue....	Medium..	" 18..	" 8..	112	18	
4	Black-eye Marrowfat....	Large	" 18 .	" 16..	120	32·5	2·5
5	Arthur Selected	Medium..	" 18..	" 16..	120	27·5	2·5
6	Mackay....	" ..	" 18..	" 16 .	120	27·2	2·2
7	Wisconsin Blue....	" ..	" 18..	" 16..	120	30	2
8	Paragon....	" ..	" 18..	" 16..	120	26	2
9	White Marrowfat....	Large	" 18..	" 16 .	120	21·7	1·7
10	English Grey....	Medium..	" 18..	" 16..	120	16·5	1·5

OATS AND BARLEY.

Number.	Name of Variety.	Date of sowing.	Date of ripening.	Number of days maturing.	Average length of straw, including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of grain per acre.	Smut.
					Inches.		Inches.	Lb.	
1	Thousand Dollar and				Oats 38		6		
	Swedish Chevalier....	June 19..	Oct. 16..	119	Barley 26	9	2	1,020	Much.
2	Daubeney and				Oats 40		6		
	Manchurian....	" 19..	" 2..	105	Barley 26·5	10	2·5	900	Very little.
3	Daubeney and				Oats 36		6		
	Early Chevalier	" 19..	" 8..	111	Barley 22	10	2	840	"
4	Gold Rain and				Oats 45		7		
	Swan's Neck....	" 19..	" 16..	119	Barley 27	10	2	840	Much.
5	Banner and		Did not		Oats 36		6		
	Duckbill....	" 19..	ripen.	......	Barley 28	9	2	...	"

SEED GRAIN FOR SALE.

Arrangements are being made, for future years, to grow an acre or more of at least one variety of wheat, oats, barley and peas, so that a certain amount of seed may be available to sell to farmers who wish to secure a bushel or two of pure seed of the best varieties.

EXPERIMENTAL FARM, BRANDON, MAN.

W. C. McKILLICAN, B.S.A., SUPERINTENDENT.

SPRING WHEAT.

Four named varieties of spring wheat were tested in uniform test plots of one-fortieth acre each. The seed was sown on May 7, at the rate of 1½ bushels per acre. The land was sandy loam and was well summer-fallowed the previous year. The extreme drought in June injured the grain, particularly Prelude, on account of it being headed out at this time. Wet weather, later in the season, made a poor sample of grain.

Spring Wheat.—Test of Varieties.

Number.	Name of Variety.	Type of Head.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
						Inches.		Inches.	Bush.	Lb.	Lb.
1	Marquis..........	Bald....	May 7..	Aug. 22	107	33	10	2·7	36	40	60
2	Red Fife...........	Bald....	" 7..	" 28	113	37	10	2·7	36	00	57
3	Garton's No. 46....	Bearded	" 7..	" 26	111	38	10	3·5	33	20	60
4	Prelude...........	Bearded	" 7..	" 2	87	26	8	2·2	14	00	61

FIVE-YEAR AVERAGES.

Two of these varieties, Marquis and Red Fife, have been grown for five years. For Manitoba conditions, these varieties are recommended.

The following are the average results for five years:—

Variety.	Average Stiffness of Straw.	Average No. of days Maturing.	Average Yield per Acre.	
			Bush.	Lb.
Marquis....................................	Stiff........	106	43	42
Red Fife....	Stiff..	112	40	12

NEW VARIETIES.

In addition to the named varieties, ten new varieties, recently produced by the Dominion Cerealist, were tested, under numbers. These varieties were tested under the same conditions as the other four. They suffered badly in the June drought and sent out many late shoots in the subsequent wet weather. This year's results do not indicate that any of these will be serious rivals of Marquis or Red Fife for Manitoba use.

STRAINS OF RED FIFE.

In order to test the purity, yielding power, earliness, etc., of different strains of Red Fife, seed was obtained from a number of the seed houses and also from farmers who are well known as growers of Red Fife of quality. The following results were obtained:—

Strain of Red Fife.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.		No. of foreign heads per thousand.
				Inches.		Inches.	Bush.	Lb.	
Brandon Experimental Farm..	May 8	Aug. 31	115	40	10	3¼	40	00	½
Dow Bros' "Registered".....	" 8	Sept 1	116	40	10	3½	38	40	½
W. H. English "Registered".	" 8	" 3	118	41	10	3½	36	40	1
A. E. McKenzie Co. "Gold Standard".................	" 8	" 3	118	40	10	3¼	40	40	2
Thos. Thompson "Registered"	" 8	" 3	118	40	10	3½	39	20	2
Wm. Laughlin "Prizewinning"	" 8	" 5	120	40	10	3¼	32	00	2
Wm. Rennie Co.	" 8	" 6	121	40	10	3¼	41	20	6
J. T. Maynard's "Prizewinning"................	" 8	" 7	122	40	10	3	30	00	10

OATS.

Sixteen varieties of oats were sown in uniform test plots. They were sown on May 9 at the rate of two and one-half bushels per acre. The land was sandy loam, and had been well summer-fallowed the previous year. The extreme drought, followed by extreme wet, caused a large amount of second growth, which was late in ripening.

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Bush.	Lb.	Lb.
1	Banner..................	May 9	Sept. 3	117	42	9	8	105	30	35½
2	Twentieth Century......	" 9	" 6	120	46	3	8	105	30	35
3	Improved American......	" 9	" 3	117	42	9	8	104	24	36
4	Thousand Dollar.........	" 9	" 6	120	46	1	8	102	12	34½
5	Gold Rain (yellow)........	" 9	" 3	117	48	6	7	101	6	36
6	Newmarket...............	" 9	" 7	121	46	5	8	100	00	34½
7	Siberian..................	" 9	" 5	119	42	7	7	98	28	33½
8	Swedish Select............	" 9	" 5	119	46	2	8	98	28	34½
9	Victory or Seger..........	" 9	" 3	117	41	9	6	96	16	37
10	Ligowo (Swedish).........	" 9	" 7	121	46	3	8	96	16	34½
11	Irish Victor.............	" 9	" 3	117	42	9	8	91	26	35½
12	Orloff (yellow)...	" 9	Aug. 28	111	40	8	6	91	26	32
13	Victor (black)	" 9	Sept. 5	119	56	7	13	90	20	31
14	Daubeney.....	" 9	Aug. 31	114	43	8	5	88	8	34
15	Garton's No. 22...	" 9	Sept. 5	119	48	6	8	71	26	34
16	Regenerated Abundance..	" 9	" 7	121	46	3	8	69	14	34

Variety Test Plots, Brandon Experimental Farm.

Banner still holds its own as the best all-round variety for Manitoba. The storms at harvest time tested the strength of the straw of the different varieties, and made very interesting comparisons. Some varieties stood up well, while others were very badly lodged. The common idea that stiff coarse-strawed varieties will stand up best was not upheld by this test. Finer-strawed sorts seemed to have more elasticity and to be able to bend before the wind, without breaking. The varieties which stood up best were the Banner and Improved American, which are probably identical, and the new Swedish variety, Victory.

FIVE YEAR AVERAGES.

Nine of these varieties have been grown for five years continuously, and the average yields are reported herewith. Two others have been grown four years, and two more for three years.

Variety.	Average Strength of Straw.	Average No. of Days Maturing.	Average Yield per Acre.	
			Bush.	Lb.
Improved American	Stiff	101	103	21
Banner	"	101	101	45
Twentieth Century	Medium	102	98	31
Swedish Select	"	101	96	13
Irish Victor	Stiff	101	96	7
Siberian	"	101	95	33
Thousand Dollar	Medium	101	94	11
Ligowo	"	101	89	33
Daubeney	Stiff	94	77	9
Regenerated Abundance (average of 4 years)	Fairly stiff	101	87	22
Orloff (average of 4 years)	Stiff	93	82	4
Gold Rain (average of 3 years)	Fairly stiff	103	92	2
Victory (average of 3 years)	Stiff	103	88	5

INFLUENCE OF LOCATION ON SEED OATS.

In co-operation with two of the American Experiment Stations, an experiment is being tried to compare the results obtained in sowing seed oats from different parts of the continent. The seed came originally from the same source in 1910. One lot was grown in Wisconsin, one in Ohio and one at Brandon in 1911. Seed from the three sources was sown on uniform test plots under the same conditions as the tests of varieties of oats with the following results:—

Number.	Name of Variety.	Date of Sowing.		Date of Ripening.		No. of Days Maturing.	Average Length of Straw including head	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	
							Ins.		Ins.	Bush.	Lb.
1	Swedish Select (Brandon seed)	May	9	Sept.	5	119	46	2	8	98	28
2	Swedish Select (Ohio seed)	"	9	"	6	120	46	1	8	90	20
3	Swedish Select (Wisconsin seed)	"	9	"	6	120	46	2	8	90	20

SIX-ROW BARLEY.

Ten varieties of six-row barley were tested in uniform test plots. They were sown on May 20, at the rate of two bushels per acre. The land was sandy loam and was summer-fallowed the previous year. Most of the plots were badly lodged, some of the earlier sorts alone escaping.

SIX-ROW BARLEY.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
					Ins.		Ins.	Bush.	Lb.	Lb.
1	O.A.C. No. 21...........	May 20	Aug. 26	98	36	7	2·5	87	24	45
2	Garton's No. 68.	" 20	" 30	102	34	5	2·2	86	32	46
3	Manchurian	" 20	" 28	100	38	7	3	80	40	46
4	Odessa....................	" 20	" 31	103	33	3	2·5	80	40	45
5	Mensury...................	" 20	" 28	100	37	6	2·7	79	8	46
6	Silver King............	" 20	" 30	102	31	4	2	74	8	45
7	Mansfield......	" 20	" 29	101	38	8	2·5	73	16	45
8	Yale...	" 20	" 26	98	37	6	2·7	71	32	44
9	Guy Mayle (hulless)	" 20	" 21	93	29	10	2·5	67	24	56
10	Success (beardless).	" 20	" 18	90	27	10	2·2	65	40	45

O. A. C. No. 21 and Manchurian are recommended as the best sorts of six-row barley at present under test.

FIVE YEAR AVERAGES.

Five of these varieties have been grown for five years with the following average results:—

Variety.	Average Stiffness of Straw.	Average No. of days Maturing.	Average yield per Acre.	
			Bush.	Lb.
O. A. C., No. 21..	Stiff..........	86	67	—
Mensury..............................	Fairly stiff....	87	66	38
Odessa	Medium.. . .	88	64	10
Yale	Fairly stiff ...	87	63	34
Mansfield.......	Fairly stiff....	87	60	18

TWO-ROW BARLEY.

Seven varieties of two-row barley were tested in uniform test plots. They were sown on May 20, at the rate of two bushels per acre. The land was sandy loam, summer-fallowed the previous year. Nearly all varieties were very badly lodged by the storms at harvest time.

Two-row Barley.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Average length of straw, including head.	Strength of straw on a scale of 10 points.	Average length of head.	Yield of Grain per acre.		Weight per measured bushel after cleaning.
					Ins.		Ins.	Bush.	Lb.	Lb.
1	Hannchen	May 20.	Sept. 4.	107	35	2	2.5	73	16	47
2	Brewer	" 20.	" 6.	109	39	1	3.0	73	16	46
3	Clifford	" 20.	" 2.	105	41	6	3.5	65	40	47
4	Gold	" 20	" 5.	108	35	1	3.0	65	00	48
5	Beaver	" 20.	" 6.	109	48	8	5.0	62	24	48
6	Canadian Thorpe	" 20.	" 3.	106	38	2	3.5	62	16	47
7	Swedish Chevalier	" 20.	" 6.	109	36	0	3.5	56	32	45

Two-row barleys, as a class, are not as well suited to this climate as six-row varieties. They are lighter-yielding, later and more inclined to lodge.

FIVE YEAR AVERAGES.

Four of these varieties have been grown for five years, and one more has been grown for three years. The following are the average results of these tests:—

Variety.	Average Strength of Straw.	Average No. of days Maturing.	Average Yield per Acre.	
			Bush.	Lb.
Canadian Thorpe	Medium	92	59	5
Swedish Chevalier	Weak	95	56	26
Clifford	Fairly stiff	89	51	10
Beaver	"	92	50	10
Hannchen (average of 3 years)	Medium	95	67	12

FLAX.

Eight varieties of flax were tested in uniform test plots. They were sown on June 8, at the rate of one-half bushel per acre. The land was sandy loam, summer-fallowed the previous year. On account of their being sown so late, and the latter part of the summer being cool and wet, all varieties were more or less injured by frost.

FLAX.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Yield of Grain per Acre.		Weight per measured Bushel after cleaning.
					Inches.		Bush.	Lb.	Lb.
1	N.D.R. No. 114.....	June 8....	Sept. 24..	108	24	8	24	16	55
2	N.D.R. No. 52......	" 8....	" 26..	110	24	3	23	32	55
3	N.D.R. No. 73......	" 8....	" 29..	113	26	2	20	00	55
4	White Flowering....	" 8....	" 29..	113	22	6	18	32	54
5	Primost...........	" 8....	Oct. 2..	115	24	3	18	32	53
6	La Plata..........	" 8....	" 3..	117	18	7	17	48	51
7	Common............	" 8....	Sept. 25..	109	26	7	16	24	55
8	Russian...........	" 8....	" 25..	110	30	5	14	16	51

The three numbered varieties were obtained from Professor Bolley, of the North Dakota Agricultural College. This is the first year they have been tested here, and they have made a good showing. If further tests confirm this one, these varieties may prove of value.

FIELD PEAS.

Ten varieties of field peas were sown on May 8, at from two to three bushels per acre, depending on the size of the pea. The land was sandy loam, summer-fallowed the previous year.

PEAS.—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Yield of Grain per Acre.		Weight per measured bushel after Cleaning.
						Bush.	Lb.	Lb.
1	Solo..........................	Medium	May 8..	Sept. 23	126	42	40	60
2	Arthur Selected	"	" 8..	" 16	119	38	—	63
3	Prussian Blue.................	"	" 8..	" 29	131	34	—	63
4	Arthur	"	" 8..	" 28	130	32	—	62
5	Mackay........................	"	" 8..	Oct. 1	134	24	—	61
6	Prince........................	"	" 8..	" 1	134	24	—	60
7	English Grey..................	"	" 8..	" 1	134	24	—	56
8	Chancellor....................	Small...	" 8.	Sept. 30	133	23	40	61
9	Paragon	Medium	" 8..	Oct. 1	134	20	40	59
10	Golden Vine	Small...	" 8..	" 5	138	14	—	61

The earlier varieties did the best this year on account of the cool wet summer. Solo, a new variety from Sweden, seems to be very promising.

FIVE YEAR AVERAGES.

Eight of these varieties have been under test for five years with the following average results:—

Variety.	Average number of days maturing.	Average Yield per acre.	
		Bush.	Lb.
Mackay	120	44	15
Prince	122	43	27
Paragon	122	41	25
English Grey	123	40	39
Arthur	120	39	39
Golden Vine	125	37	42
Prussian Blue	120	37	37
Chancellor	119	36	15

FIELDS OF SEED GRAIN.

Fields of several varieties of pure seed grain were grown, for the purpose of supplying the Dominion Cerealist with seed for free distribution, to have a supply of clean seed for general use on the Farm, and to be able to sell small quantities to Manitoba farmers who wished to purchase. The following were the lots grown:—

Variety.	Preparation of land.	Acres	Yield per acre.		Total Yield.	
			Bush.	Lb.	Bush.	Lb.
Marquis wheat	Sod, broken and back-set	13	44	00	572	00
Prelude "	Corn and root land.	$\frac{3}{4}$	19	36	14	42
No. 363 E1	" "	$1\frac{1}{4}$	27	12	34	00
Banner oats	Summer fallow	6	85	00	510	00
Abundance oats	"	$2\frac{1}{4}$	79	33	179	00
Thousand Dollar oats	Clover sod, spring ploughed	10	75	24	757	00
Daubeney oats	Summer fallow	2	85	00	170	00
Manchurian barley	"	$2\frac{3}{4}$	57	27	158	00
Arthur peas	"	$1\frac{1}{2}$	19	00	28	30

In addition to this a supply of pure Red Fife wheat, O. A. C. No. 21 barley and Arthur peas was grown on the fields devoted to the rotation experiments and reported under the department of Field Husbandry.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

ANGUS MACKAY, SUPERINTENDENT.

SPRING WHEAT.

Three named varieties and ten new kinds under numbers were tested on one-fortieth acre plots. The land was summer-fallowed the previous year, and the seed was sown at the rate of one and one-half bushels per acre. As will be noticed, Prelude wheat ripened very early.

Only the named varieties are reported on, as the tests of the numbered sorts are regarded as merely preliminary.

SPRING WHEAT.—Test of Varieties.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average length of Head.	Yield of Grain per acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lb.	Bus.	Lb.	Lb.
Marquis	Apr. 10.	Aug. 3.	129	47	10	3·3	4,640	·77	20	63
Marquis (special plot for chemist)	" 10.	" 17.	129	44	10	3·5	4,880	81	20	63
Prelude	" 10.	" 17.	115	29	10	2·5	2,655	44	15	63·5
Red Fife H	" 10.	" 24	136	47	10	3·5	3,840	64	00	61

FIELD TEST.

In a field test of Prelude and Marquis, side by side on similar land, Prelude ripened in 111 days, and gave a yield of 42 bushels 18 pounds per acre, the grain weighing 63·5 pounds to the measured bushel. Marquis required 126 days, gave 47 bushels 6 pounds per acre, and weighed 63 pounds per bushel.

FIVE YEARS' COMPARISON OF FIELD LOTS.

The average yield per acre and the time taken to mature of two varieties of wheat grown in field lots under similar conditions for the past five years, are given below:—

Variety.	Average Days to Mature.	Average Yield per Acre.	
		Bus.	Lb.
Marquis	125·2	40	11
Red Fife	137	37	43

FALL WHEAT.

Alberta Red fall wheat was sown on September 16, 1911, on fallowed land. It was ripe on August 21, and gave a yield of 33 bushels and 20 pounds per acre.

Three varieties received from D. H. Ross, Canadian Commissioner, Melbourne, Australia, were also sown on the same date, but were entirely winter or spring killed.

OATS.

Twelve varieties of oats were sown on fallowed land at the rate of two bushels of seed per acre. All gave very large yields. A second growth came up in all varieties; grain was badly lodged.

OATS.—Test of Varieties.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per acre.		Weight per Measured bushel after Cleaning.
				Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
Abundance, "Regenerated"	May 1.	Aug. 25	116	50	10	8·5	4,352	128	00	34·5
Bauner	"	" 29	120	50	10	9	5,312	156	8	35
Danish Island	"	" 23	114	51	10	8	5,552	163	10	34
Daubeney	"	" 14	105	42	10	8	4,052	119	6	34·7
Eighty Day	"	" 14	105	39	10	6	4,192	123	10	34·7
Gold Rain	"	" 23	114	59	10	9	4,692	138	00	38·5
Ligowo, Swedish	"	" 25	116	50	10	8	4,512	132	24	37
Siberian	"	" 23	114	55	10	8·5	5,152	151	18	35·5
Swedish Select	"	" 22	113	51	10	9	4,952	145	22	36·5
Thousand Dollar	"	" 22	113	49	10	8	5,080	149	14	35·5
Twentieth Century	"	" 23	114	50	10	7·5	3.950	116	6	36·5
Victory	"	" 23	114	50	10	8	5,520	162	12	35·5

BARLEY.

Seven varieties of six-row and eight varieties of two-row sorts were sown on fallowed land at the rate of two bushels of seed per acre. All sorts were badly lodged but gave large yields, and rains, after grain was in the stook, coloured the grain.

Two-row Barley.—Test of Varieties.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
Canadian Thorpe.....	April 27	Aug. 22	117	41	5	3	4,200	87	24	52
Clifford........	" 27	" 15	110	44	5	3	3,520	73	16	51
Danish Chevalier. ...	" 27	" 27	122	36	0	4	4,000	83	16	51·5
Early Chevalier......	" 27	" 18	113	41	5	3·2	3,360	70	00	50
Hannchen.	" 27	" 22	117	38	5	3.5	4,800	100	00	53·2
Invincible.......... ..	" 27	" 25	120	40	5	3	4,520	94	8	51·5
Standwell.	" 27	" 25	120	42	5	2·5	4,464	93	16	51
Swedish Chevalier....	" 27	" 27	122	38	5	3·5	3,760	78	16	51

Six-row Barley.—Test of Varieties.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
Mansfield..	April 27	Aug. 9	104	39	10	2·7	3,580	74	28	50·5
Manchurian..	" 27	" 12	107	41	8	3·5	4,080	85	00	49
O.A.C. No. 21.......	" 27	" 12	107	40	8	3	4,480	93	16	49·7
Oderbruch.....	" 27	" 9	104	32	8	3	3,480	72	24	50·5
Stella	" 27	" 9	104	40	10	2	4,320	90	00	49·5
Trooper.....	" 27	" 10	105	38	10	2·5	3,480	72	24	49·5

PEAS.

Ten varieties of peas were sown on fallowed land, at the rate of two bushels of small, and three bushels per acre of large varieties. The plots were one-fortieth acre each.

All were late in ripening, and were overtaken by frost before fully matured.

Peas.—Test of Varieties.

Name of Variety.	Size of Pea.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushed after cleaning
					Inches.	Inches.	Lb.	Bush.	Lb.	Lb.
Arthur...............	Medium	April 25	Sept. 5	133	50	2·5	2,480	41	20	62
Chancellor	Small ..	" 25	" 6	134	50	3	2,760	46	00	62
English Gray........	Medium	" 25	" 6	134	52	2·7	3,000	50	00	61·5
Golden Vine	Small ..	" 25	" 6	134	50	2·5	2,800	46	40	63
Gregory.........	Medium	" 25	" 12	140	60	2	3,280	54	40	61·5
Paragon	"	" 25	" 13	141	65	2·7	3,360	56	00	61
Prince	Large ..	" 25	" 13	141	60	2·5	3,520	58	40	62
Prussian Blue........	Medium	" 25	" 13	141	50	2·7	2,480	41	20	60·5
Solo....	Large ..	" 25	" 10	138	48	2·5	2,640	44	00	61·7
Mackay.............	Medium	" 25	" 12	140	65	2·5	3,320	55	20	60

Photo by C. E. Saunders.

Prelude Wheat in Stook. Experimental Farm Indian Head, Sask.

Photo by C. E. Saunders.

Cutting Prelude Wheat on Farm of E. B. Cay, Beatty, Sask.

FLAX EXPERIMENTS.

Five varieties of flax were sown on May 15 on fallowed land: Common, Improved Russian, White Flowering, Yellow Seed and Premost. Premost gave twenty-two bushels per acre. The seed of the other four varieties was old, and did not germinate over one-third, and the yields were not kept. The seed intended to be sown was destroyed by fire.

TARES.

Tares were sown on the 15th of May on fallowed land, but did not ripen before frost came, and were so badly injured that, although cut, were not threshed, and were useless for hay. Frost came on the 15th of September.

FIELDS OF GRAIN.

A large quantity of seed grain is raised every year on this Farm for the free distribution carried on from the Central Farm at Ottawa, and also for sale from Indian Head to farmers in Saskatchewan.

The following table gives a summary of the results from these fields this past season.

It should be noted that part of the Marquis wheat, ordinary stock, Red Fife wheat and Banner oats was sown on stubble land. The yields of these varieties cannot, therefore, be fairly compared with the others.

SUMMARY of Returns from Fields of Grain grown for Seed.

—	Total area.	Total Yield.		Average Yield per acre.	
	Acres.	Bush.	Lb.	Bush.	Lb.
Spring Wheat—					
Marquis, ordinary stock	30·8	1,090	00	35	23
Marquis, Special Registered	2·0	94	12	47	6
Red Fife	38·3	1,299	42	33	56
Prelude	1·1	46	35	42	18
Variety not named	1·15	58	10	54	26
Oats—					
Banner	28·26	1,937	8	68	18
Abundance	26·59	2,118	2	79	22
Ligowo, Swedish	2·22	241	3	108	20
Barley—					
Manchurian	19·58	1,275	35	65	7
Mensury	10·5	379	15	36	6
O. A. C. No. 21	2·5	81	47	32	38
Canadian Thorpe	2·44	136	11	55	40
Hannchen	2·42	137	45	57	00
Peas—					
Arthur	....	....		36	51
Golden Vine	....	....		50	49
Flax—					
Premost	....	....		15	47

EXPERIMENTAL STATION, ROSTHERN, SASK.

WM. A. MUNRO, B.A., B.S.A., SUPERINTENDENT.

SPRING WHEAT.

The following are the results of the yields of spring wheat in 1912, together with the number of days maturing. All these plots were sown on April 17. There will also be seen the yields of this grain for 1911.

In addition to the named varieties, seven new cross-bred sorts, under numbers, were tested.

Number.	Variety.	Number of Days Maturing.	Average Length of Straw.	Average Length of Head.	Yield per Acre. 1912.		1911.	
			Inches.	Inches.	Bush.	Lb.	Bush.	Lb.
1	Marquis	133	40	3	43	20	70	..
2	Huron	143	48	4	40	40	73	20
3	Chelsea	133	50	3	39		66	..
4	Stanley	143	56	3	36	40	62	40
5	Bobs (Seager Wheeler)	127	34	3·5	36	..	62	..
6	Bobs (Ottawa)	127	44	3	34	40	..	..
7	Bishop	143	44	2·7	34	..	58	40
8	Preston (Seager Wheeler)	143	46	3·5	34	..	66	40
9	Pringle's Champlain	143	40	4	33	20	65	20
10	Red Fife (G. L. Smith)	137	48	3	32	40	60	..
11	Riga	135	52	3·5	32	..	64	40
12	Prelude	117	32	1·5	29	20	..	..
13	Early Red Fife	139	48	3·5	27	20	60	..
14	White Fife	Not ripe when cut.	52	4·5	20	40	59	20
15	Red Fife regenerated	143	52	3·5	16	40	50	..
16	Yellow Cross	125	38	2·5	16	..	..	..

OATS.

Sixteen varieties of oats were under test in 1912. These were seeded on April 22. The Eighty Day is a selection by Dr. Chas. Saunders made from the Sixty-day White, and proved the most satisfactory of all early oats. The yield of 63 bushels per acre does not represent the total yield, because this plot was considerably injured by the crows.

Number.	Variety.	Number of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a Scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.			
						1912.		1911.	
			Inches.		Inches.	Bush.	Lb.	Bush.	Lb.
1	Abundance	133	57	8	8	94	4	125	30
2	Victory	132	54	8	6·7	83	18	109	14
3	Thousand Dollar	138	64	8	8·5	80	..	116	16
4	Sixty Day White	109	42	10	..	76	16	96	16
5	Irish Victor	133	52	5	9·5	75	10	128	8
6	Danish Island	134	57	9	8·5	75	10	130	20
7	Improved American	132	52	6	8	74	4	127	2
8	Abundance regenerated	134	56	6	8·5	71	26	121	6
9	Swedish Select	133	54	5	7·5	71	26	117	22
10	Banner	133	56	8	8·5	70	20	131	26
11	Ligowo	139	52	6	7·5	69	14	121	6
12	Daubeney	109	34	10	5·5	68	8	101	6
13	Twentieth Century	134	56	8	7	68	8	128	8
14	Siberian	136	.	..	..	65	30	109	14
15	Eighty Day	109	41	10	6	63	18	..	..
16	Gold Rain	135	54	7	8·2	61	6	127	2

BARLEY.

Fifteen varieties of barley were sown on uniform trial plots. These were seeded on April 26.

Unfortunately, the yield of Early Indian for 1912 cannot be given. This is the earliest of all the barleys, is very short in the straw, and in 1911 gave very poor results. In 1912, however, the crop was more promising, but just before harvest it was almost totally destroyed by crows, which prevents the possibility of our giving the yield. If the yield of Early Indian can be shown to be nearly up to that of other varieties it will be a great boon to the northern climates, and to those conditions where late sowing is a necessity.

Number.	Variety.	No. of days Maturing	Average length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average length of Head.	Yield of Grain per acre.			
						1912.		1911.	
			Inches.		Inches.	Bus.	Lb.	Bus.	Lb.
1.	Black Japan	122	34	10	3	70	40	93	16
2.	Swan's Neck	124	38	3	3·5	66	32	78	16
3.	Duck Bill	123	52	4	3	61	32	85	..
4.	Taganrog	131	36	4	3	59	8	81	32
5.	Mensury	125	48	5	2·5	58	16	81	32
6.	O. A. C. 21	127	49	3	3	57	4	94	8
7.	Manchurian	125	50	5	3·5	55	40	96	32
8.	Swedish Chevalier	126	40	3	4	55	40	71	32
9.	Early Chevalier	122	48	8	2·5	54	28	79	8
10.	Success	104	36	10	2·5	49	8	58	16
11.	Stella	121	51	8	5	49	8	83	16
12.	Hannchen	127	34	3	2	47	24	81	32
13.	Odessa	124	41	5	3·5	44	8	100	40
14.	Beaver	124	....	8	....	38	16	70	40
15.	Early Indian	101	23	10	1·5	....	....	19	8

PEAS.

The yields of 11 varieties of peas are shown herewith, together with those of 1911. All our pea crops were much more satisfactory in 1912 than in 1911 because of the better opportunity of ripening, due to delay of early frosts. All the varieties under test ripened in good condition.

The Arthur Selected, although showing eighth in point of yield in 1912, is considered the most satisfactory of all the varieties owing to the fact that it was the only one of all that fully ripened in the season of 1911.

Number.	Variety.	No. of days Maturing.	Average length of Straw.	Average length of Pod.	Yield per acre. 1912.		Yield per acre. 1911.	
			Inches.	Inches.	Bus	Lb.	Bus.	Lb.
1.	Paragon	146	72	3	43	20	48	..
2.	Prussian Blue	142	76	3	39	20	46	40
3.	Mackay	146	70	2	48	..	37	20
4.	Chancellor	135	60	2·2	36	40	37	20
5.	Gregory	146	60	2·2	33	20	....	....
6.	Wisconsin Blue	146	68	2	32	..	31	20
7.	Golden Vine	134	54	1·7	31	20	24	40
8.	Arthur, selected	132	40	2	29	20	51	20
9.	Black Eye Marrowfat	Half ripe when cut.	62	2·5	29	20	26	40
10.	White Marrowfat	146	68	2·5	26	40	36	..
11.	English Grey	135	58	3	25	20	38	..

EXPERIMENTAL STATION, SCOTT, SASK.

R. E. EVEREST, B.S.A., SUPERINTENDENT.

SPRING WHEAT.

Eleven varieties of spring wheat, including six unnamed sorts produced by the Dominion Cerealist, were sown on the 13th of April in plots of one-fortieth acre each at the rate of one and three-quarter bushels per acre.

The weather was fine during seeding, and, the land being in good condition, the grain came up evenly.

Hot, dry weather in June dwarfed the growth of early varieties. Later sorts gave a moderate yield. The season being long permitted all varieties to mature. The sample harvested was somewhat uneven on account of a second growth, which had been encouraged by late rains.

Spring Wheat.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of straw on a scale of 10 points	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.
					Ins.		Ins.	Lb.	Bus. Lb.
1	Huron Selected.	April 13	Sept. 3	142	37	10	3	2,330	38 50
2	Red Fife	" 13	" 3	142	39	10	3	2,012	33 32
3	Marquis	" 13	Aug. 30	138	32	10	3	1,570	26 10
4	Alpha Selected	" 13	Sept. 3	142	38	10	3	1,440	24 00
5	Prelude (135 B)	" 13	Aug. 6	115	26	10	2·3	820	13 40
	Spring Rye— Ottawa Select	" 15	" 31	139	30	8	3·7	1,140	20 20

OATS.

Ten varieties were sown on the 23rd of April on land which had been summer-fallowed the previous year. Two and one-quarter bushels of seed were sown per acre.

All gave heavy yields of grain and large crops of straw, which was badly lodged by wind and rain.

It was difficult for the oat plots to ripen owing to their lodged condition, but a subsequent test of the threshed grain reveals good germinating power in all varieties.

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.
					Ins.		Ins.	Lb.	Bus. Lb.
1	Victory	April 23	Sept. 12	142	54	6	7·5	5,146	151 12
2	Ligowo Swedish	" 23	" 11	141	58	5	8	4,794	141 00
3	Gold Rain	" 23	" 11	141	56	6	7	4,758	139 32
4	Abundance, Garton's Regenerated	" 23	" 12	142	54	5	6·5	4,600	135 10
5	Tartar King	" 23	" 11	141	70	8	14	4,152	122 4
6	Banner	" 23	" 11	141	62	5	10·5	4,110	120 20
7	Thousand Dollar	" 23	" 11	141	53	4	8	3,875	113 33
8	Twentieth Century	" 23	" 11	141	54	5	7	3,801	111 27
9	Eighty Day	" 23	" 11	141	44	5	6·5	3,752	110 12
10	Daubeney	" 23	" 12	142	50	4	6	3,400	100 00

BARLEY.

Five varieties of six-row and three varieties of two-row barley were sown on the 22nd of April, at the rate of two bushels of seed per acre, on plots of one-fortieth acre each. The land was summer-fallowed the previous year.

Two varieties of six-row, Manchurian and O. A. C. No. 21, were very fair standing crops, and gave good returns. The two-row barleys, although giving the larger yields, were not so desirable as the six-row, for the following reason: The two-row barleys were so weak in the straw that harvesting was made a difficult operation.

SIX-ROW BARLEY.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.
					Ins.		Ins.	Lb.	Bush. Lb.
1	Manchurian	April 22	Sept. 7	138	41	5	3	3,120	65 00
2	O.A.C. No. 21	" 22	" 4	135	30	5	2	3,091	64 19
3	Black Japan	" 22	" 7	138	20	6	2	1,810	37 34
4	Success	" 22	Aug. 6	106	20	8	2·2	520	10 40
5	Early Indian	" 22	July 29	98	18	10	1·7	100	2 4

TWO-ROW BARLEY.

1	Duckbill	April 22	Sept. 4	135	24	4	3	4,223	87 47
2	Hannchen	" 22	" 11	142	29	4	3·5	3,613	75 13
3	Early Chevalier	" 22	" 4	135	36	4	3	2,489	51 41

PEAS.

Six varieties were sown on the 6th of May on fallowed land. Each plot was one-fortieth of an acre in area, and the seed was sown at the rate of two and one-half bushels per acre.

Growth throughout the season was favourable, the earlier varieties producing matured grain of good quality. The Arthur pea, in germination test, as well as in yield, heads the list.

PEAS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Size of Pea.	Character of Growth.	Yield of Grain per Acre.	Yield of Grain per Acre.	
							Lb.	Bush.	Lb.
1	Arthur	May 6	Sept. 24	141	Medium	Strong	2,270	37	50
2	Golden Vine	" 6	Oct. 9	156	Small	"	1,800	30	00
3	Chancellor	" 6	Sept. 24	141	"	"	1,680	28	00
4	Prussian Blue	" 6	Oct. 9	156	Medium	"	1,290	21	30
5	English Grey	" 6	Sept. 24	141	"	"	1,110	18	30
6	White Marrowfat	" 6	Oct. 9	156	Large	"	610	10	10

EXPERIMENTAL STATION, LETHBRIDGE, ALBERTA.

W. H. FAIRFIELD, M.S., SUPERINTENDENT.

THE SEASON.

The season of 1912 resembled that of 1911 in that the rainfall during the early part was deficient, while during the latter part the usual amount was received.

The results of the crops on the Station during the summer of 1912 have been interesting, although in many instances somewhat disappointing. The season opened up in a most propitious manner. Work on the land began on March 28 and the first seeding was done on April 1, although it would have been possible to begin a little earlier. The soil was left moist from the fall of 1911 and the land was in excellent shape to work in the spring, consequently the grain crops, in fact all crops planted, were put in under exceedingly favourable conditions where land had been prepared the summer or fall previous. However, the rainfall during April, May and until the end of June, in the immediate vicinity of Lethbridge, was extremely light. Grain sown on summer-fallowed land and on very early spring ploughing, where the land was cultivated immediately afterwards, came up well, because it was possible to place the seed in moisture. Germination on land that was not so treated was not good.

On account of the previous season closing up so early in the fall of 1911 it was impossible for the farmers in southern Alberta to do much fall ploughing, the result being that a great deal of grain was ' stubbled ' in this past spring, and most of this, in the Lethbridge district, germinated poorly.

The rainfall was very light indeed until the last few days in June, but from then on, during July, August and September, it was above normal. On account of this light rainfall during the first part of the growing season, all early-sown crops, and especially winter wheat, suffered acutely. Crops that looked extremely promising early in the season gave but low yields. Late-sown crops, on the other hand, did much better, providing they ripened before the frost.

The yields of all the crops on the non-irrigated portion of the Station were rather low, with the exception of peas and such late growing crops as turnips, potatoes, etc.

On the irrigated portion of the Station, however, where water was applied in June, and in some cases even in May, the yields were very much more satisfactory. In the case of hay, however, especially alfalfa, we found the rainy season rather difficult to operate in, as it was hard to get it cured properly. Alfalfa usually makes its most rapid growth when supplied with the necessary moisture during the hot weather of July and August, but this year, on account of the many showers during this period, the weather was not as hot as it ordinarily is, so the alfalfa fields did not produce quite as much as they usually do.

PART I.—THE NON-IRRIGATED FARM.

EXPERIMENTS WITH WINTER WHEAT (NON-IRRIGATED).

Eight varieties of winter wheat and one of emmer were tested. These were sown on summer-fallowed land on one-sixtieth acre plots. A good stand was obtained in each case in the fall, but the drought of May and June affected them materially.

WINTER WHEAT.—Test of Varieties (Non-irrigated).

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Average Length of Straw including head.	Average Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				Inches.	Inches.	Lb.	Bush.	Lb.	Lb.
1	No. 17 Wyoming	Sept. 1	July 29	26	2·7	1,530	31	00	64·5
2	Ghirka	Aug. 31	" 24	28	2·7	3,780	30	00	65
3	Egyptian Amber	" 31	" 27	34·5	4·5	2,370	28	00	65·5
4	Dawson's Golden Chaff	" 31	" 25	30·5	3	1,620	26	15	64·5
5	Tasmania Red	" 31	" 26	31	3·5	2,040	24	00	64·5
6	Azima	" 31	" 24	32·5	4	1,740	19	45	65·5
7	Kharkov	" 31	" 24	29·5	2·5	1,260	19	15	65
8	Kansas Red	" 31	" 24	27	2·5	960	17	30	64·5
	Winter Emmer (Buffum)	Sept. 2	Aug. 24	38·5	3	1,290		1,080	35

FIELD LOTS OF WINTER WHEAT (NON-IRRIGATED).

The following fields of Kharkov winter wheat were sown on summer-fallowed land on September 2, 1911, on land ploughed the different depths indicated in the table.

Area.	Depth ploughed.	Date Ripe.	Yield of Grain per Acre.	
Acres.	Inches.	1912.	Bush.	Lb.
1.02	6	July 21	23	32
1.06	5	July 21	20	55
1.02	4	July 21	18	33

On September 12, 1911, we sowed 3·32 acres of Ghirka winter wheat on summer-fallowed land. This was ripe on July 30, and yielded at the rate of 28 bushels per acre.

SPRING WHEAT.

Sixteen varieties were tested, including five un-named sorts which are not inserted in the table. These were sown on summer-fallowed land at the rate of about a bushel and a peck per acre.

SPRING WHEAT.—Test of Varieties (Non-irrigated).

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average length of straw, including head.	Average Length of Head.	Yield of Grain per acre.		Weight per measured bushel after cleaning.	Average yield per acre for 4 years.	
					Inches.	Inches.	Bush.	Lb.	Lb.	Bush.	Lb.
1	Huron............	April 3..	August 8..	127	26	3	31	52	65	25	1
2	Stanley	" 3...	" 6	125	27	3	31	30	63	24	55
3	Red Fife	" 3...	" 9.	128	28	3	31	8	62	27	14
4	Preston............	" 3...	" 7.	126	28½	3·5	31	00	64	26	20
5	Marquis (special plot for chemist).. ..	" 3...	" 3.	122	26½	3	29	00	65·5	24	2
6	Marquis	" 3...	" 4.	123	27½	2·7	28	30	.....	......	......
7	Early Red Fife.....	" 3...	" 9.	128	26½	3	26	56	63	......	......
8	Early Russian......	" 3...	" 2.	121	26	2·5	26	52	65	......	......
9	Bobs...............	" 3...	" 1.	120	26	2·5	23	00	64	......	......
10	Yellow Cross.......	" 3...	" 2.	121	25	2·5	20	30	65	......	......
11	Prelude (135 B). ...	" 3...	July 25...	113	25	2·2	18	00	.....	......	......
	Common Emmer...	" 4...	Aug. 10..	128	29	2		1,320	......	......	......

FIELD LOTS OF SPRING WHEAT.

A field of Marquis wheat, 2·06 acres in area, was sown on summer-fallowed land on April 8. It yielded at the rate of 20 bushels and 4 pounds per acre.

EXPERIMENTS WITH OATS.

Eleven varieties were sown on April 16 on one-sixtieth acre plots on summer-fallowed land.

OATS.—Test of Varieties (Non-irrigated).

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Average Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Average Yield for 4 Years.	
					In.	In.	Lb.	Bush.	Lb.	Lb.	Bush.	Lb.
1	Victory.....	Apr. 16	Aug. 17	123	40·5	6	4,860	106	14	37·5	..	..
2	Danish Island......	" 16	" 17	123	36	5·5	3,120	87	23	36 5	60	23
3	Improved American	" 16	" 17	123	35·5	5·5	3,000	87	16	37	69	16
4	Gold Rain.........	" 16	. 17	123	37	6	3,180	82	32	37	*52	2
5	Irish Victor. . .	" 16	" 17	123	3[illegible]	6	3,060	81	6	36	59	4
6	Abundance, Garton's regenerated.	" 16	" 17	123	35·5	5·5	3,300	78	18	36	*48	4
7	Banner.......	" 16	" 17	123	36·5	5·5	2,820	77	22	36	58	30
8	Lincoln...........	" 16	" 17	123	35	5·5	3,060	75	00	39	62	28
9	Thousand Dollar...	" 16	" 17	123	28	5	2,940	70	20	36	47	00
10	Ligowo Swedish...	" 16	" 17	123	35	5·5	3,000	70	8	37·5	..	..
11	Daubeney..........	" 16	July 24	99	22·5	5	1,770	37	32	35	..	..

* Average for two years only.

FIELD LOTS OF OATS.

A field of Banner oats, 15·73 acres in size, was sown on land on which grain had been grown the year previous. It was sown on April 24 and ripe on August 23. The field yielded at the rate of 45 bushels and 25 pounds per acre, but was considerably damaged by the cutworms.

EXPERIMENTS WITH BARLEY.

Seven varieties of six-row and five varieties of two-row barley were grown on summer-fallowed land. They were all sown on one-sixtieth acre plots at the rate of one bushel and three pecks per acre.

Six-row Barley.—Test of Varieties. (Non-Irrigated.)

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Average Length of Head.	Weight of Straw	Yield per acre.		Weight per measured bushel after cleaning.	Average yield for 4 years.	
					Inches.	Inches.	Lb.	Bush.	Lb.	Lb.	Bus.	Lb.
1	Odessa	Apr. 18	Aug. 3	107	22	2	1,830	34	18	50·5	31	24
2	Cole	" 18	......	......	21·5	2	2,010	30	30	47	......	
3	Claude	" 18	" 5	109	21·5	1·7	2,250	28	36	50	34	15
4	O.A.C. No. 21	" 18	" 5	109	20·5	2	1,710	28	6	52	*20	00
5	Guy Mayle	" 18	July 24	97	22	2	2,250	28	6	63	......	
6	Mansfield	" 18	Aug. 5	109	22·5	2	2,250	27	24	53	32	00
7	Manchurian	" 18	" 5	109	21	2	2,550	23	6	49	......	

* Average for two years only.

Two-row Barley.—Test of Varieties. (Non-Irrigated.)

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Average Length of Head.	Weight of Straw	Yield per Acre.		Weight per measured bushel after cleaning.	Average yield for 4 years.	
					Inches.	Inches.	Lb.	Bush.	Lb.	Lb.	Bush.	Lb.
1	Invincible	April 18	Aug. 19	123	24·5	2	2,760	42	24	53	36	36
2	Swedish Chevalier.	" 18	" 8	112	23	2·5	2,760	41	12	53	38	3
3	Hannchen.	" 18	" 3	107	19·5	2·5	2,160	38	36	55	*20	00
4	Clifford.	" 18	" 21	125	29	2·5	2,520	30	00	52	29	30
5	Early Chevalier	" 18	July 29	102	20·5	2·5	1,440	23	36	54		

*Average for two years only.

EXPERIMENTS WITH BUCKWHEAT.

Three varieties of buckwheat were grown on summer-fallowed land on one-sixtieth acre plots.

BUCKWHEAT.—Test of Varieties. (Non-Irrigated.)

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Bus.	Lb.	Lb.
1	Japanese	May 31	Sept. 14	106	26	12	58
2	Silver Hull (western seed)	" 31	" 14	106	23	6	50
3	Silver Hull (eastern seed)	" 31	" 14	106	19	18	50

EXPERIMENTS WITH PEAS.

Ten varieties of peas were sown on summer-fallowed land. The plots were one-sixtieth of an acre in size. They were sown on April 8 at the rate of about two or two and one-half bushels per acre, depending upon the size of the pea.

PEAS. (Non-Irrigated.)

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average length of Straw.	Weight of Straw.	Yield per Acre.		Average Yield for four years.	
					Inches.	Lb.	Bus.	Lb.	Bus.	Lb.
1	Paragon	Apr. 8	Aug. 22	136	20	2,420	48	00	*25	22
2	Mackay	" 8	" 24	138	20	2,340	46	00	*25	00
3	Prince	" 8	" 26	140	19	2,940	45	00	27	42
4	English Grey	" 8	" 23	137	19	2,400	43	00	25	54
5	Prussian Blue	" 8	" 25	139	20	2,460	42	00	27	35
6	Picton	" 8	" 23	137	24	2,400	41	00	†27	20
7	Golden Vine	" 8	" 23	137	18	2,580	38	00	25	00
8	White Marrowfat	" 8	" 27	141	24	2,550	37	30	22	12
9	Arthur	" 8	" 23	137	21	2,790	36	30	24	19
10	Chancellor	" 8	" 23	137	20	2,520	35	00	22	28

* Average for five years. † Average for three years only.

EXPERIMENTS WITH WINTER RYE.

A small plot of one-sixtieth of an acre of winter rye was sown August 31, 1911, on summer-fallow. It was ripe on July 24. The length of straw, including head, was 45 inches. It yielded at the rate of 33 bushels and 12 pounds per acre.

SPRING RYE.

A small plot of one-sixtieth of an acre of spring rye was sown on May 11 on summer-fallowed land. It was ripe September 10. The length of straw including head was 35½ inches. It yielded at the rate of 19 bushels and 16 pounds per acre.

PART II.—THE IRRIGATED FARM.

WINTER WHEAT.

A small field of winter wheat, 1·56 acres, was sown on summer-fallowed land on September 1, 1911. It was irrigated on May 14 and 15. It was ripe on July 31 and, when threshed, yielded at the rate of 54 bushels and 28 pounds per acre.

EXPERIMENTS WITH SPRING WHEAT.

Five varieties of spring wheat were grown on spring-ploughed alfalfa sod, in plots of one-sixtieth acre each. They were sown on April 3. They received one irrigation on June 5.

SPRING WHEAT.—Test of Varieties. (Irrigated.)

Number.	Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Average Length of Straw including Head.	Average Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.	Average for 5 years.	
					Ins.	Ins.	Lb.	Bush.	Lb.	Lb.	Bush.	Lb.
1	Red Fife	Apr. 3	Aug. 20	139	47	3·5	4,030	63	12	64	43	39
2	Preston..................	" 3	" 7	126	44	4	4,680	54	13	64	42	28
3	Huron	" 3	" 8	127	36·5	3·5	3,780	50	15	64	42	24
4	Marquis (from Ottawa). .	" 3	" 8	127	40·5	4·2	3,900	50	5	64·5	*43	6
5	Stanley	" 3	" 7	126	47	3·5	4,830	44	30	63·5	33	48
6	Marquis (home-grown). ...	" 3	" 7	126	36	3·5	3,780	43	00	..	..	..

NOTE.—*Average for three years only.

EXPERIMENTS WITH OATS.

Five varieties of oats were grown on spring-ploughed alfalfa sod in plots of one-sixtieth acre each. They were sown on April 16. One irrigation was given on June 5.

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Length of Straw, including head.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Average yield for 5 years.	
					Inches.	Inches.	Lb.	Bush.	Lb.	Lb.	Bus.	Lb.
1	Banner............	April 16	Aug. 10	116	47·5	7·0	4,560	145	16	38·0	93	..
2	Improved American	" 16	" 11	117	49·5	7·0	4,620	142	2	38·5	95	30
3	Irish Victor.......	" 16	" 10	116	48·5	6·5	4,500	141	6	39·5	90	32
4	Danish Island.....	" 16	" 10	116	49·0	6·0	4,470	141	6	39·0	90	6
5	Gar. Reg. Abund'ce	" 16	" 14	120	44·0	6·0	4,380	105	30	35·0	....	

FIELD LOTS OF OATS.

The following field lots of oats were grown in 1912:—

Variety.	Area.	Preparation of land.	Date Sown.	Date Ripe.	Date Irrigated.	Yield per Acre.	
	Acres.					Bush.	Lb.
Banner.	0·12	Spring ploughed alfalfa sod....	April 15..	Sept. 13..	June 4..	100	..
"	0·32	Land on which grain was grown in 1911	" 17..	Aug. 21..	" 4..	94	7
"	2·64	Summer fallow................	" 6..	" 13..	" 11.	132	19
"	5·39	Grain in 1911.	" 27..	" 27..	" 12..	67	11

EXPERIMENTS WITH BARLEY.

Five varieties of six-row and five varieties of two-row barley were grown on spring ploughed alfalfa sod. They were sown on April 18, in plots one-sixtieth of an acre each. One irrigation was given on June 5.

SIX-ROW BARLEY.—Test of Varieties (irrigated).

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Straw including Head.	Average Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Average Yield for 5 yrs.	
					Inches.	Inches.	Lb.	Bush.	Lb.	Lb.	Bush.	Lb.
1	Claude.....	Apr. 18	Aug. 8	112	34	2·7	3,660	81	30	50·5	65	37
2	Odessa	" 18	" 5	109	37	2·5	4,020	80	26	54	56	12
3	Manchurian	" 18	" 6	110	40	3·2	4,050	78	43	51	*59	43
4	O. A. C. No. 21. ..	" 18	" 6	110	39·5	2·7	3,270	76	42	49	*75	15
5	Mansfield..... ..	" 18	" 7	111	39	2·5	3,870	61	42	53·5	53	38

TWO-ROW BARLEY.—Test of Varieties (irrigated).

											For 4 yrs.	
1	Swedish Chevalier.	Apr. 18	Aug. 18	122	35	3	4,140	77	24	55·5	†66	12
2	Invincible	" 18	" 20	124	44	3	4,710	69	18	55	52	29
3	Hannchen	" 18	" 6	110	39	3	3,990	66	42	48	....	
4	Clifford	" 18	" 7	111	42	3	5,040	55	18	54	40	7
5	Early Chevalier...	" 18	" 5	109	43	3·5	3,900	52	39	51	....	

* Yield for two years only.
† Average for five years.

FIELD LOTS OF BARLEY.

The following fields of barley were grown in 1912:—

Variety.	Area.	Condition of Land, 1911.	Date Sown.	Date Ripe.	Date Irrigated.	Yield per acre.	
	Acres.					Bush.	Lb.
Swedish Chevalier......	.087	In peas.........	April 29....	August 9..	June 11....	57	46
Mansfield..............	.46	In peas.........	" 29 ..	" 8..	" 11 ...	37	28
Odessa......	.29	In peas.........	" 29 ..	" 6..	" 11....	50	2
Claude.....	.65	In peas.........	" 29 ..	" 7..	" 11 ...	55	20
O.A.C. No. 21..........	.037	In alfalfa.......	" 26 ..	" 6..	" 5....	49	26
Swedish Chevalier......	.22	Hoed crops....	" 26 ..	" 20..	" 8....	99	34
Clifford................	.4	Summer-fallow..	" 29 ..	" 20..	" 11....	88	31

EXPERIMENTS WITH BUCKWHEAT.

Three varieties of buckwheat were sown on spring ploughed alfalfa sod on plots one-sixtieth of an acre in size. They received one irrigation on June 5. They were sown on May 31.

BUCKWHEAT.—Test of Varieties (irrigated).

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Bush.	Lb.	Lb.
1	Silver Hull (Eastern seed).....	May 31.....	Sept. 11....	103	63	36	56
2	Japanese.................... ...	" 31.....	" 14....	106	45	00	59
3	Silver Hull (Western seed)....	" 31.....	" 14 ...	106	43	36	56

EXPERIMENTS WITH PEAS.

Nine varieties of peas were sown in plots of one-sixtieth of an acre each on land on which hoed crops had been grown the year previous. They were sown on April 2, at the rate of about two or two and one-half bushels per acre, depending on the size of the peas. The crop received one irrigation on June 5.

PEAS.—Irrigated.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average length of Straw.	Weight of Straw.	Yield per Acre.		Average yield for five years.	
					Inches.	Lb.	Bush.	Lb.	Bush.	Lb.
1	Prince	April 2..	Aug. 30..	150	53	4,320	80	00	38	30
2	Paragon	" 2..	" 30..	150	42	4,080	74	00	43	00
3	Mackay	" 2..	" 30..	150	42	4,020	70	00	39	1
4	English Grey	" 2..	" 23..	143	33	3,720	65	00	35	56
5	Picton	" 2..	" 30..	150	49	3,540	64	00	33	27
6	Prussian Blue	" 2..	" 30 .	150	42	3,660	57	00	31	30
7	Golden Vine	" 2..	" 30..	150	48	3,480	56	00	31	16
8	Arthur Selected	" 2..	" 20..	140	25	3,000	49	00	..	..
9	Chancellor	" 2..	" 21..	141	33	3,000	45	00	29	28

FIELD LOTS OF PEAS.

The following field lots of peas were grown in 1912:—

Variety.	Area.	Date Sown.	Date Ripe.	Date Irrigated.	Condition of Land in 1911.	Yield per Acre.	
	Acres.					Bush.	Lb.
Paragon	·52	April 2....	Sept. 13....	June 5....	Grain.	62	10
Mackay	·049	" 2....	" 14....	" 5....	Grain.	74	50

EXPERIMENTAL STATION, LACOMBE, ALBERTA.

G. H. HUTTON, B.S.A., SUPERINTENDENT.

EXPERIMENTS WITH SPRING WHEAT.

Sixteen varieties of spring wheat were tested in 1912. A number of these varieties are comparatively new and are recorded under numbers only and are not yet available for general distribution. Several of these new wheats stood very well here this year, in comparison with older wheats. Further trials are necessary before they can be definitely recommended, but judging from this year's results, a number of them are well worth further trial. All varieties of spring wheat were seeded on black loam soil, which had been summer-fallow in 1911. One-fortieth acre plots were used and seed was sown on April 15, at the rate of two and one-quarter bushels per acre. Only the named varieties are mentioned in the table.

Spring Wheat.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw, including Head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Huron..........	Apr. 15.	Sept. 11.	149	48	10	3·7	3,290	54	50	61
2	Bishop..........	" 15.	" 8.	146	46	9	3·2	3,020	50	20	54
3	Bobs..............	" 15.	" 7.	145	39	10	3·2	3,010	50	10	56
4	Red Fife..........	" 15.	" 14.	152	45	9·7	3·5	2,520	42	00	55
5	Early Russian.....	" 15.	" 9.	147	46	5	3·5	2,440	40	40	58
6	Prelude...........	" 15.	Aug. 28.	135	36	10	2·2	2,350	39	10	62
7	Marquis..........	" 15.	Sept. 12.	150	43	10	3·5	1,980	33	00	60
8	Yellow Cross	" 15.	" 7.	145	40	10	3	1,290	21	30	60

EXPERIMENTS WITH WINTER WHEAT.

All the varieties of winter wheat were spring-killed, and no report can be given upon them.

EXPERIMENTS WITH RYE.

One plot of fall rye was sown on September 5, 1911, on summer-fallow, but for the first time on record here, fall rye also spring-killed. A plot of spring rye was sown on April 26 on land that was summer-fallow in 1911.

Variety.	Date Ripened.	No. of days Maturing.	Length of Straw in Inches.	Character of Straw.	Length of Head in Inches.	Weight of Straw.	Yield per Acre.	
						Lb.	Bush.	Lb.
Spring rye......	Sept. 12..	139	49	10	3¼	7,540	65	20

EXPERIMENTS WITH OATS.

Fourteen varieties of oats were tested in 1912. The plots were one-fortieth acre in size and were seeded on April 25, on land that was summer-fallow in 1911. Seed was used at the rate of two and one-half to three bushels per acre.

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured bushel after Cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Victory	April 25	Sept. 7	135	57	10	6·7	4,640	136	16	35
2	Irish Victor......	" 25	" 7	135	54	10	7·5	3,880	114	4	40
3	Siberian....	" 25	" 7	135	53	4·5	7·2	3,500	102	32	38
4	Banner............	" 25	" 7	135	55	8	7·5	3,440	101	6	38
5	Daubeney	" 25	" 1	129	46·5	6.5	6·5	2,920	85	30	35
6	Reg. Abundance..	" 25	" 7	135	51	8·5	6·7	2,840	83	18	36
7	McDougal Scottish Prolific.........	" 26	" 8	135	57·5	10	7	2,800	82	12	33
8	Ligowo, Swedish..	" 25	" 7	135	53	10	7	2,760	81	6	40
9	Gold Rain........	" 25	" 6	134	55	10	7·5	2,440	71	26	37
10	Tartar King......	" 25	" 4	132	55	10	8	2,160	63	18	38
11	Danish Island	" 25	" 7	135	54	7·5	7	2,020	59	14	38
12	Swedish Select....	" 25	" 7	135	54·5	10	6·5	1,960	57	22	38
13	Eighty Day.	" 25	Aug, 24	121	42	10	5·2	1,160	34	4	35
14	Thousand Dollar..	" 25	Sept. 7	135	52	10	6·5	1,080	31	26	18

EXPERIMENTS WITH BARLEY.

The test of varieties of barley was conducted on black clay loam soil which had been summer-fallowed in 1911. The plots were all one-fortieth acre in size and were seeded on April 25, seed being used at the rate of two and one-quarter bushels per acre.

SIX-ROW BARLEY.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured bushel after Cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Mansfield....	Apr. 25	Aug. 24	121	44	7·5	2	3,820	79	28	52
2	O. A. C. No. 21 ..	" 25	" 24	121	47	9	2·5	3,800	79	8	50
3	Odessa	" 25	Sept. 6	134	47	8·5	3·2	3,620	75	20	50
4	Manchurian	" 25	" 6	134	49	8	3·5	3,320	69	8	50
5	Stella	" 25	Aug. 26	123	44	5	2·5	3,000	62	24	51
6	Guy Mayle	" 25	" 26	123	28½	10	2	2,400	50	00	60
7	Success..	" 25	" 12	109	36	10	3	1,750	36	22	49
8	Early Indian	" 25	" 12	109	22	8·5	1·7	580	12	4	47

TWO-ROW BARLEY.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after Cleaning.
					Inches.		Inches.	Lb.	Bush.	Lb.	Lb.
1	Hannchen..........	Apr. 25	Sept. 7	135	38	5	3	3,660	76	12	50
2	Swan's Neck......	" 25	" 7	135	46	7	2·7	3,620	75	20	52
3	Swedish Chevalier..	" 25	" 7	135	44	5	3·5	3,220	67	4	49
4	Invincible..........	" 25	" 7	135	47	8	3	3,130	65	10	50
5	Early Chevalier....	" 25	Aug. 23	120	47	8	3	2,710	56	22	54

EXPERIMENTS WITH PEAS.

Seven varieties of Canadian field peas were tested in 1912. The seed was sown on April 25, at the rate of two and one-half to three bushels per acre, on one-fortieth acre plots. The soil had been summer-fallowed in 1911, and was a black clay loam on clay sub-soil.

PEAS.—Test of Varieties.

Number.	Name of Variety,	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after Cleaning
					Inches.	Lb.	Bush.	Lb.	Lb.
1	Chancellor...	April 25	Sept. 3	131	2·2	1,770	29	30	65
2	Arthur	" 25	" 3	131	2·2	1,690	28	10	64
3	Mackay	" 25	" 3	131	2·7	1,680	28	00	48
4	Paragon..	" 25	" 3	131	2·5	1,400	23	20	61
5	Golden Vine..	" 25	" 3	131	2	1,310	21	50	61
6	English Grey.	" 25	" 3	131	2·7	1,300	21	40	60
7	Prussian Blue	" 25	" 3	131	2·5	890	14	50	64

EXPERIMENTS AT ST. BERNARD MISSION, GROUARD, ALTA.

(IN CHARGE OF REV. BRO. LAURENT.)

Arrangements have been made for carrying on experiments in cereals at this location; but it was not possible, after the arrangements had been completed, to procure the necessary grains in good time for sowing.

The following varieties were sown on June 1, as soon as practicable after the seed arrived:—

Spring wheat.—Marquis, 5 pounds sown; cut September 21; yield, 78 pounds.

Spring wheat.—Preston, 10 pounds sown; cut September 21; yield, 298 pounds.

Oats.—Ligowo, 12 pounds sown; cut September 21; yield, 204 pounds.

Barley.—Manchurian, 8 pounds sown; cut September 12; yield, 183 pounds.

Another sample of Marquis wheat, which had been received during the winter from the Dominion Cerealist, was sown May 2, cut September 5, and yielded 155 pounds. This was sown on new breaking.

EXPERIMENTAL STATION, FORT VERMILION, ALTA.

(IN CHARGE OF ROBERT JONES.)

EXPERIMENTS WITH CEREALS.

Eight varieties of spring wheat, four of oats, five of barley, and one of peas, were tested in plots. The plots of Excelsior oats and Champion barley failed, on account of the injury from cut-worms and drought.

SPRING WHEAT.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.	Weight per measured bushel after Cleaning.
					Inches.		Inches.	Lb.	Bush. Lb.	Lb.
1	Preston	Apr. 30	Aug. 26	119	44	6	3·7	4,140	69 30	64·3
2	Ladoga	" 29	" 19	113	42	6	3	3,300	55 ..	64
3	Marquis	" 29	Sept 3	128	42	8	4	3,000	50 ..	66
4	Riga	" 30	Aug. 17	110	45	10	3·7	3,000	50 ..	65
5	Stanley	" 29	" 21	115	41	8	3·7	2,820	47 ..	64
6	Bishop	" 29	" 22	118	42	10	4	2,730	45 30	65
7	Red Fife	" 29	Sept. 2	127	43	10	3·5	2,610	43 30	63
8	Kubanka	" 30	" 5	129	40	6	3	2,040	34 ..	60·2

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre	Yield of Grain per Acre.	Weight per measured bushel after Cleaning.
					Inches.		Inches.	Lb.	Bush. Lb.	Lb.
1	Ligowo	May 7	Sept. 4	120	53	6	10	2,480	72 32	38.3
2	Tartar King	" 7	" 4	120	50	6	9	2,160	63 18	35
3	Banner	" 7	" 3	119	47	10	9	2,040	60 ..	34

BARLEY.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of straw on a Scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after Cleaning.
							Inches.	Lb.	Bush.	Lb.	Lb.
	Six-row.										
1	Mensury	May 10	Aug. 23	105	39	8	3·5	3,630	75	30	49·5
2	Claude	" 11	" 15	97	40	6	3·5	3,040	63	16	46
	Two-row.										
1	Canadian Thorpe	May 11	Aug. 20	101	38	8	3	2,820	58	36	52
2	Sidney	" 11	Sept. 2	115	41	6	4	2,670	55	30	49·2

Field peas, Arthur, plot one-sixtieth of an acre, sown April 30, cut September 5. Length of vine, 4 feet; length of pod, 3 inches; quite green when cut. Yield per acre, 24 bushels. Weight per measured bushel, after cleaning, 65 pounds

EXPERIMENTAL FARM, AGASSIZ, B.C.

P. H. MOORE, B.S.A., SUPERINTENDENT.

GRAIN CROPS.

This year we grew at the Farm here twelve varieties of wheat, fourteen varieties of oats, seven varieties of two-row barley, eight varieties of six-row barley, and thirteen varieties of peas. These varieties were tested in plots of one-sixtieth acre each.

All of the grain, with the exception of the peas, was sown on land upon which corn had been grown in 1911. The land was a light, sandy loam underlaid with gravel, with the gravel cropping through in some places, but the cultivation was thorough.

The peas were sown on fall-ploughed land with a couch-grass soil that had been ploughed early the fall before, and an attempt made to have the couch-grass cleaned out. Late in the season of 1912 the couch-grass got a start and somewhat reduced the yield of peas.

The harvest weather in this section was most abominable, and all grain, except that which had been head selected, got wet many times and the quality was very low.

SPRING WHEAT.

Of the twelve varieties sown this year, the Marquis headed the list, but the yield of all of them was low and the quality poor. Two of the varieties, which have not yet been named, are omitted from the table.

SPRING WHEAT.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of straw on a Scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.	
							Inches.	Lb.	Bush.	Lb.
1	Marquis	April 17	Aug. 5	110	40	8	3	1,380	23	..
2	Alpha Selected	" 17	" 8	113	41	8	3	1,380	23	..
3	Bobs	" 17	" 9	114	38	8	3	1,260	21	..
4	Bishop	" 17	" 12	117	40	10	3	1,080	18	..
5	Pringle's Champlain	" 17	" 9	114	38	8	3·5	1,080	18	..
6	Preston	" 17	" 6	111	41	9	2	1,020	17	..
7	Stanley	" 17	" 5	110	40	9	3	960	16	..
8	Early Red Fife	" 17	" 7	112	41	7	3	960	16	..
9	Red Fife	" 17	" 9	114	40	8	3·5	840	14	..
10	Huron	" 17	" 6	111	41	8	3	720	13	..

OATS.

The result of the fourteen varieties of oats will be seen in the following table. They are listed in order of merit from the standpoint of yield for this year.

OATS.—Test of Varieties.

Number.	Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average length of Straw, including head.	Strength of straw on a scale of 10 points.	Average length of Head.	Yeild of Grain per Acre.	Yield of Grain per Acre.	
					Inches.		Inches.	Lb.	Bus.	Lb.
1	Irish Victor	Apr. 17	Aug. 6	111	41	9	9	2520	74	4
2	Danish Island	" 17	" 7	112	43	8	9	2190	64	14
3	Improved Ligowo	" 17	" 6	111	40	9	9	2160	63	18
4	Daubeney	" 17	July 22	102	38	9	7	2010	59	4
5	Banner	" 17	Aug. 5	110	42	8	9	1920	56	16
6	Regenerated Abundance	" 17	" 5	110	43	9	9	1890	55	20
7	Eighty Day	" 17	July 18	98	38	8	8	1800	52	32
8	Lincoln	" 17	Aug. 7	112	42	10	8	1770	52	2
9	Twentieth Century	" 17	" 3	108	41	10	10	1740	51	6
10	Siberian	" 17	" 5	110	42	9	9	1740	51	6
11	Improved American	" 17	" 12	117	42	10	8	1620	47	22
12	Swedish Select	" 17	" 12	117	40	9	9	1560	45	30
13	Gold Rain	" 17	" 10	115	41	9	9	1500	44	4
14	Thousand Dollar	" 17	" 12	117	43	8	10	1380	40	20

BARLEY.

The two-row barley, as a class, yields better in this Lower Fraser country than does the six-row barley. Following are the results of each:—

BARLEY, SIX-ROW.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average length of Straw, including Head.	Strength of straw on a scale of 10 points.	Average length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.	
					Inches.		Inches.	Lb.	Bush.	Lb.
1	Oderbruch	April 17	July 22	96	44	10	3	1,980	41	12
2	Manchurian	" 17	" 27	101	41	8	3	1,980	41	12
3	Odessa	" 17	" 22	96	40	8	3	1,860	38	36
4	Mansfield	" 17	" 27	101	41	10	3·5	1,860	38	36
5	Success (Beardless)	" 17	" 12	86	36	8	2·5	1,800	37	24
6	Yale	" 17	" 29	103	42	10	3	1,740	36	12
7	O. A. C., No. 21	" 17	" 24	98	42	10	3·5	1,680	35	00
8	Trooper	" 17	" 27	101	38	9	3	1,620	33	36

BARLEY, TWO-ROW.—Test of Varieties.

1	Hannchen	April 17	Aug. 3	108	45	10	4	2,100	50	00
2	Swedish Chevalier	" 17	" 5	110	45	8	4·5	2,280	47	24
3	Canadian Thorpe	" 17	July 31	105	46	10	4	2,220	46	12
4	Invincible	" 17	Aug. 6	111	48	9	4·5	2,100	43	36
5	Beaver	" 17	July 29	103	40	7	4	2,040	42	24
6	Danish Chevalier	" 17	Aug. 3	108	44	7	4	1,980	41	12
7	Clifford	" 17	July 29	103	42	8	3·5	1,680	35	00

PEAS.

The following is the result from the fifteen varieties of seed. The English Gray, which was received from Lacombe, Alta., was the largest yielder this year, but the results of all the plots were very low on account of the bad harvest weather and the great amount of shelling.

PEAS.—Test of Varieties.

Number.	Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.
					Inches.	Inches.	Lb.	Bush.
1	English Gray (Lacombe stock)	Apr. 22	Aug. 12	117	50	3	1,440	24
2	Chancellor	" 22	" 10	115	48	2·5	1,380	23
3	Mackay	" 22	" 13	118	52	3·5	1,320	22
4	Daniel O'Rourke	" 22	" 10	115	46	2·5	1,260	21
5	Black-eye Marrowfat	" 22	" 14	119	53	3·5	1,200	20
6	White Marrowfat	" 22	" 12	117	53	3	1,140	19
7	Golden Vine	" 22	" 14	119	42	2·5	1,080	18
8	Paragon	" 22	" 13	118	50	3	1,080	18
9	Prince	" 22	" 13	118	48	3·5	1,080	18
10	Arthur Selected	" 22	" 12	117	50	3	960	16
11	Prussian Blue	" 22	" 14	119	52	3	960	15
12	Wisconsin Blue	" 22	" 13	118	50	3	840	14
13	Picton	" 22	" 12	117	52	3	840	14

Dominion of Canada

DEPARTMENT OF AGRICULTURE

Dominion Experimental Farms

REPORT

FROM

THE DIVISION OF BOTANY

For the Fiscal Year Ending March 31, 1913

PREPARED BY

The Dominion Botanist. . . . . H. T. Güssow

REPORT

OF THE

DIVISION OF BOTANY.

J. H. Grisdale, Esq., B.Agr.,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the report of the Division of Botany for the year ending March 31, 1913, being the fourth annual report of this Division.

The present report is an account of that part of the work carried on by the various members of the staff of the Division, which is considered to be of more general interest. It is a bulletin of miscellaneous botanical information and appears in a somewhat changed form, inasmuch as it is partially prepared by the several members of the staff under their own names instead of, as heretofore, by the Dominion Botanist.

While all work in the Division is carried on under the direction or with the approval of the Dominion Botanist, the varied character of that work renders it necessary that individual members of the staff devote themselves largely to different lines of work or the solution of special problems. It is hoped that by reserving the credit for original work done by them, and thus stimulating them to acquire a scientific reputation of their own, the present arrangement will encourage such work and thus contribute to the raising of the standard of the report from both the scientific and the practical standpoints.

The work of the Division has extended considerably and progressed satisfactorily during the past year and I am pleased in this place to acknowledge the ever-ready assistance rendered by the members of my staff.

I have the honour to be, sir,
Your obedient servant,

H. T. GÜSSOW,
Dominion Botanist.

MILK BACTERIOLOGICAL INVESTIGATIONS.

During the year the Division conducted an inquiry into the bacterial contents of the milk produced by the Farm herd. It was first necessary to examine the bacterial contents of the natural milk, and also to inquire into the sources of any bacterial contamination with a view to eliminating, as much as possible, impurities of such character.

The investigations required much time and thought, since, as they progressed further, new phases of work had to be taken up; partly because of the limitation of space in this report, and partly because the experiments will be continued, we only give a brief progress report here and reserve the publication of all details for an exhaustive report to be published later.

In order to familiarize the manual staff of stable and dairy with the meaning of 'bacteria,' the Director requested the Dominion Botanist to give a series of demonstrations and addresses before these men, which were well attended and which resulted in establishing the deeper interest of the men in the various experiments which became necessary. Owing to the interest manifested, the series of addresses proved a real pleasure to the lecturer.

Because of the scientific nature of such work, some very elementary explanations became necessary, and the nature, development and significance of 'bacteria' were carefully gone into.

The work itself may be divided into three main groups:—

1st. Experiments made with a view to discovering and eliminating sources of bacterial contamination of milk.

2nd. Quantitative examination of milk before and after certain measures suggested for improvement.

3rd. Comparative quantitative examination of bacterial contents of milk, as produced by hand milking and machine milking.

SIGNIFICANCE OF BACTERIA IN MILK.

Before giving an account of the various phases of the work carried on, a few remarks as to the meaning of bacteria in milk may be welcome.

The bacterial content of milk varies naturally according to the health of the animal from which the milk is obtained, and the treatment and care the milk receives thereafter. For the examination of the bacterial contents, a small quantity of milk is generally sufficient. One cubic centimeter (or 1 'cc.' in its usual form of abbreviation) is commonly examined. This quantity is taken from an average, representative sample by means of an absolutely clean and sterile graduated pipette or glass tube, the capacity of which is accurately measured. This is dipped in the milk and the latter drawn up by gentle suction. According to the size of the pointed mouth of such a pipette one cubic centimeter will 'drop' from 20 to 25 single drops of milk. Hence, a cubic centimeter is equal to a quantity of from about 20 to 25 drops of the liquid examined. There are 568·34 cubic centimeters in the imperial pint.

Bacteria are amongst the smallest organisms of plant life and owing to their purpose in nature are most abundant where dirt and filth accumulate and where the conditions are generally unsanitary. They are principally scavengers of nature and cause the decomposition and final disappearance of any kind of vegetable or animal matter. In this respect they are decidely useful, but no one would consider them a useful addition to the milk or food consumed. They must in such place be considered as impurities and in the nature of contamination.

While most kinds of these organisms are not actually disease-causing, yet they may very quickly spoil for human consumption milk and other food that would remain wholesome otherwise. Where, however, the bacterial purity of milk becomes of great moment, is at times when certain germ epidemics prevail, such as typhoid, cholera, infantile diarrhœa, and also the ever-present scourge of mankind, tuberculosis. All of these serious diseases have been communicated by means of infected milk, and for these reasons the freedom of milk from disease-causing organisms especially, is one of the most vital necessities of the milk supply of cities.

The work was begun in July, 1912, and preliminary investigations were carried out to discover the sources of bacteria in the milk.

Thus the bacterial content of the stable air were examined, when the floor was dry or sprinkled with water, also several kinds of bedding were tested; the cows were also bacterially inspected before and after cleaning in order to keep trace of bacteria falling from the animals into the pail during milking.

The men engaged in milking were cautioned to observe particular cleanliness. The hands of the milkers were examined occasionally for bacterial contamination; also the milk pails, cans, bottles were carefully examined before and after special cleaning operations. In this manner some very interesting data came to light, and after eliminating the sources of contamination as much as possible, the bacterial contents of the milk were then regularly examined. From time to time check examinations were made in order to discover any infringements of the rules of sanitation.

About a week was required to get the results to coincide, which they very accurately did after that time.

At first, hand milking was employed alone. From July 25th, a milking machine was put into operation and comparative tests were conducted to find out by which method the purest milk could be obtained. Throughout our tests, the hand milk was cleaner than the machine milk. The reason for this was that the rubber tubing of the milking machine soon got into a condition where no matter how carefully cleaning was practised, it could not be made quite sweet and pure, but when the old tubing, etc., was changed for new, the bacterial purity immediately improved.

It was also found that the milk cans sent in by dairies to receive milk at the farms were far from being bacteriologically pure.

A new cotton wadding filter was tried, the milk being tested with and without its use. At first, the contents of the unfiltered milk was lower than that of the filtered milk. After cleaning the filters properly, the unfiltered milk was less pure. Very little gain resulted from the use of these filters as far as bacteria were concerned. Dirt, etc., was, however, very satisfactorily removed.

The effect of a milk cooler on the bacteria contents was also tested. The immediate cooling of the milk was found of great service in preventing the increase of bacteria that occurred in uncooled milk.

Comparative tests of several types of milk pails were also made. Each type of pail was in use for the same period, and the results were in favour of the hooded pails.

It will be of interest at the present time, where several types of milking machines are in use at various places, to give in detail some of our comparative tests of milk obtained by machine *versus* hand milking.

Date.	Machine Milk.	Hand Milk.
1913.		
February 24	25,416 bacteria per "cc"	975 bacteria per "cc".
" 25	20,883 " "	6,579 " "
" 26	2,188 " "	1,455 " "
March 6	6,244 " "	1,098 " "
" 7	22,993 " "	1,700 " "
" 8	10,454 " "	1,700 " "
April 1	21,141 " "	350 " "
" 2	12,760 " "	919 " "
" 3	21,427 " "	391 " "
" 4	7,850 " "	847 " "

From the above ten days quoted in detail, the average daily counts for the milking machine are 15,135 organisms per cubic centimeter, and 1,590 organisms per cubic centimeter for the hand milk. The average for another similar period gave 174,693 organisms per 'cc.' in machine milk and 2,706 organisms per cc.' in hand milk. A third average computed from a period of twenty days again decided in favour of hand milking; the results obtained for machine milk were 22,112 per 'cc.,' and for hand milk, 9,358 per 'cc.'

The average bacterial contents of milk obtained by machine and by hand of all tests made, were as follows:—

Machine milk per 'cc.' 70,646 and hand milk per 'cc.' 4,551 organisms.

Notwithstanding the variations of the bacterial contents obtained at certain times, the differences have often been easy to account for. For instance, on February 24th and March 7th, some teat cups fell off during milking and before the cow could be attended to, dust and dirt had been absorbed by suction and had spoiled the milk, which though examined, was, naturally, rejected. Again, in hand milking several times the milker was changed and less experienced men had to be employed; this at once increased the number of bacteria per cc. of milk.

The experiments are being continued and finally a complete report will be issued. At the present we are able to state that the bacterial contents of the milk have been reduced after six months' work from 18,000 organisms per cc. at the beginning to some 500 organisms towards the end. Thus the milk at the Central Experimental Farm may be classed among the purest natural milks produced anywhere on the continent of America.

THE STORAGE ROTS OF POTATOES.

For some months past, an inspection of stored potatoes has been carried on by the Division of Botany, especially of potatoes among which the presence of powdery scab was suspected. During this work it was recalled that the losses from the various 'rots' affecting stored potatoes were considerable, and of far greater economic importance than is generally realized. In some instances from thirty to forty per cent of the potatoes had become quite useless, owing to various forms of dry or wet rots. This observation made early in the season was a bad outlook for the safe-keeping over winter of the remaining potatoes. 'Storage rots' of potatoes may be induced by a variety of agents. To begin with, it must be understood that a perfectly 'ripe' potato providing, of course, it is free from blight or other diseases, is less liable to be affected by rot than those harvested too early. This statement raises the question: When are potatoes ripe, *i.e.*, in the best condition to dig? Digging potatoes depends largely upon individual conditions prevailing at the

various farms; in wet land it is advisable to dig them earlier than on dry land; they will also have to be dug at a later date when badly affected by blight, in order to show the disease in the tubers, so that they may be removed, than if they were free from it; but in general potatoes are ready for digging, under normal conditions, when the stalks have died down and hence no longer take an active part in the manufacture of the reserve food which is stored in the tubers. Here it is where the psychological moment may be missed, for there are potato diseases such as late blight, early blight, rhizoctonia, or even the attacks of the flea beetle or potato bug, which may cause the premature death of the stalks, and which may be mistaken for their normal 'death.' Where these conditions prevail, the potatoes underground are not 'ripe,' and, what is more important, there is no chance of their becoming ripe, however long they are left in the soil.

A ripe potato has all its cells well supplied with food material, *i.e.,* starch, and the skin adheres firmly to the tuber when the finger or thumb is applied to the surface with a firm, rubbing movement. When the skin is easily detached during this operation, the tubers are not ripe and should be left in the ground, providing the tops are free from disease. It is an unfortunate fact, however, that the largest percentage of potato fields are attacked by late blight and the stalks are killed prematurely. In this case the tubers will also have become infected and are liable to decay in the pit or cellar, unless certain precautions are exercised.

The second fact favouring, and indeed inviting decay, is where potatoes are lying too close to the surface of the ground in the field. Such tubers are easily touched by frost, and, if not separated at once from those unaffected, they are sure to decay when placed in storage.

Another prominent source of rot in storage is the apparently unavoidable injuries during harvesting of potatoes, especially when a potato digger is used. However slightly a potato may appear to be damaged, as soon as the injury extends below the skin, the tissues rich in available food are open to an invasion by scores of fungi and bacteria, which find in such wounds a very suitable feeding ground. A large number of such injured potatoes are picked up, notwithstanding every care, and are finally deposited in the bins or pits.

The above mentioned factors, involving more or less mechanical or physical features, deserve, nevertheless, to be taken into careful consideration. The conditions described on the potatoes themselves, which may be regarded as factors weakening the power of resistance towards storage rots, and what is more, their exposure in their impaired condition of 'health' to the favourable conditions for the development of bacteria and fungi which are ever present in bins, pits or the places of storage, should certainly be regarded as the most prominent factors responsible for the largest amount of losses occurring during storage.

What is necessary to start into action the myriads of fungus spores and bacteria present everywhere, and so destructive to stored vegetable matter of any kind? Is it not the moisture, warmth, absence of ventilation and light that encourage decay and rot, and are not these conditions fairly constant in all pits, bins, etc., where potatoes are stored? Besides the excellent food in the potato is ready prepared for the use of the ravenously feeding organisms of decay. Giving these lines a moment's thought and consideration, will the majority of readers not own that these very conditions prevail in their own cases? Have your potatoes been dug at the right time, were they quite ripe? Were none touched by frost or damaged by the digger? Is your cellar or pit well ventilated? If so, you have nothing to fear from storage rot, for then you are no doubt awake to the necessity of preventing late blight and other diseases. But those who must own up to one or more similar 'sins of omission' had better turn to their potatoes at once and start hand-picking them over, taking out all potatoes that show any of these signs.

The question is frequently asked by farmers sending samples of potatoes affected with storage rot, whether there is any treatment to prevent it from spoiling the potatoes. We are afraid there is nothing to be done to stop the decay once it has set in, beyond hand-picking them, removing all damaged, frozen or diseased potatoes, providing good ventilation and using for storage a cool place.

In the preceding lines we have spoken about the result to be expected from unripe, frozen or damaged potatoes, and have pointed out that, without being actually diseased, they are liable to suffer considerable losses. But how much more quickly will the decay set in when the tubers have been attacked by late blight and other diseases, eventually finding their way into the tuber.

There are a number of distinct parasitic diseases of the growing potato which will start a 'storage rot,' and which will spread by contact from diseased to sound tubers. Late blight (*Phytophthora infestans*) is the worst offender in this respect. The amount of late blight present in a field largely depends upon the successful and rapid control of the potato bug. When the potato bug has been allowed to gain a foothold, even if only for a short period, the vines are generally so much injured that it is almost impossible to keep the late blight from playing havoc.

In some potato experiments carried out at the Central Experimental Farm, with the view of producing potatoes as free from disease as possible under practical farming conditions, we secured from the four acres grown 1,770 bushels, which averages about 440 bushels per acre, by no means a light yield; but, notwithstanding careful spraying, the potato bug had done enough damage before it was controlled, so that late blight appeared and still caused far too much loss. Unless spraying is begun very early in the season late blight is difficult to control, and often about August and September the potato tops have been killed. Thus, not only is the manufacture of the reserve food to be stored in the tuber discontinued and the tubers remain unripe, but the disease spreads into the tubers. When this has taken place, the potatoes may be left in the ground for a week or so longer, when the rot will be more apparent, but when digging the potatoes, they should be hilled up on the field, covered lightly with straw and earth until they have dried up well. Before taking them in, the potatoes should be carefully hand-picked to remove all diseased or injured potatoes.

It is hardly necessary here to mention other diseases affecting the potato plant, for whatever their nature, as soon as the tubers become affected it amounts to the same thing, they must be picked out to prevent storage rot. Diseases like potato rosette or little potatoes (generally known as *rhizoctonia*), fusarium rot and others which may affect the potato tubers must be controlled or prevented by the use of good sound seed. When the potato tuber is once affected it is very liable to decay after being stored.

I have included in the term 'storage rot' the various forms known to the plant pathologist and caused by a number of different organisms. There are a number of different bacteria producing a soft or wet rot, and also scores of fungi, which find the prevailing conditions suitable for their growth and development, and produce dry rots and decay of various forms. Whatever form of rot may be developing in storage the prevention of losses will be the same in every case, and may be summarized in the following suggestions:—

1. Sound, ripe and undamaged potatoes will keep in this condition unless brought into contact with tubers showing signs of decay.

2. The prevention of losses in storage must begin in the field, where the growing plants should be regularly sprayed to prevent diseases likely to affect the tubers.

3. Potatoes should be dug when ripe if possible. Care should be exercised to prevent damaging tubers when digging. Frozen and damaged potatoes, as well as those showing signs of disease (with the exception of common scab) should not be placed in storage with sound ones, but must be carefully picked out.

4. Bins, pits, cellars should be cool, not above 40 degrees at any time, and good ventilation should be provided.

5. The stored tubers should be overhauled at intervals, and any potatoes showing signs of disease should be removed.

If the above suggestions are carried out not only will the losses in storage be wholly prevented, but the chances of carrying certain diseases over to next year, by the use of unsound tubers, will be eliminated.

EXPERIMENTS IN GROWING POTATOES

The Director of Experimental Farms instructed the Dominion Botanist to take charge of the growing of four leading varieties of potatoes on four acres of land, principally for the purpose of producing 'as large and as profitable a crop as possible; free from disease or as free from disease as possible under conditions such as exist in Canada to-day.'

The opportunity for demonstrating the effectiveness of spraying potatoes under field conditions was very welcome and after laying out the experiments, the first results are herewith reported. The practical work concerning planting, cultivation and harvesting was carried out under the direction of the Farm Foreman, Mr. D. D. Gray.

The plan of the experiment was briefly this:—

THE LAND.

Four statute acres of land in field E 1 of the Agriculturist's part of the Farm were used. The land was the year before under sod and had not been used for potatoes previously. Like all the land of the Central Farm, the soil varied in some parts, but was generally speaking fairly even and in suitable condition for potato growing. It was divided into four lots of one acre each, the dividing lines running east and west.

VARIETIES, QUANTITY USED, DATE OF PLANTING, ETC.

The following four varieties were chosen: Carman No. 1, Irish Cobbler, Gold Coin, and Early Delaware. Date of planting, May 31st. Planted by machine, single sets, 14 inches between sets, not more than five inches deep. Rows, partly 30, partly 32 inches apart.

SPRAYING FOR POTATO BEETLES AND DISEASES.

As soon as the plants were about six inches high, spraying was begun. A four-row double cylinder sprayer was used throughout the experiments. The four-row spraying attachment as sent out by the manufacturers did not give good satisfaction; the spray pump, however, was found very satisfactory. We have carefully studied the mechanics of this attachment and suggested a number of improvements to the manufacturers which they have agreed to carry out, and next year the new attachment will be used. The objections to the present attachment were that the nozzles could not possibly spray the plants from every side. Thus some rows were only half sprayed, and the potato beetles, which were present in countless numbers, fed ravenously on the unsprayed portions of the plants and did considerable damage.

The spray solutions used were:—

No. 1—6:4:40	Bordeaux	mixture	+ 5 lbs. of Arsenate of lead.
No. 2—6:4:40	"	"	+ 5 lbs. Arsenite of soda.
No. 3—5:5:40	"	"	+ 5 lbs. Arsenate of lead.
No. 4—5:5:40	"	"	+ 5 lbs. Arsenite of soda.

The spray solutions were carefully tested by the potassium ferro-cyanide method and thus every danger from deficiency of lime and leaf-burning in consequence removed. The spray rows run across the varieties so that each quarter of an acre of each variety received a different kind of spray.

Spraying began July 6th. It required 50 gallons of spray per acre, and took 2½ hours' time for the four acres. It was arranged to spray once a week, but, owing to incessant rain, the application had to be repeated at shorter intervals, the rain washing off the spray at various times. Up to the end of August, eight applications were given. In September the vines had grown so closely together that too much injury would have resulted from further sprayings. Blight appeared during the first week in September to some extent. On September 29th the vines were cut down by frost.

It was found that while both solutions (arsenate of lead and arsenite of soda) finally destroyed the potato beetles, their action was too slow to prevent a good deal of defoliation. Arsenate of lead adhered better and longer to the foliage.

The yield of potatoes was excellent, the quality fair and fairly sound, no scab, but a slight amount of late blight spots in tubers.

The following is the statement of yields per statute acre:—

Carman No. 1	444·31	bushels.
Early Delaware	471·33	"
Irish Cobbler	455:83	"
Gold Coin	411·48	"

No advantage of any one spray solution over the other could be observed.

Considerable quantities rotted in storage; insufficient ventilation and injury in digging were thought to account for this. The experiments will be continued for several years, when a more detailed account will be prepared.

AN EXPERIMENT WITH RHIZOCTONIA DISEASE OF POTATOES.

A rectangular area of land about $\frac{1}{16}$ acre in extent had the preceding year borne a crop of peas very badly affected with rhizoctonia. It was decided to see what results would accrue from the planting of this with potatoes and incidentally to try the effect of various treatments against this disease. One-half of the area was given a dressing of lime at the rate of three tons per acre early in the year, and the other half left untreated. Four varieties of potatoes were used, viz.:—Gold Coin, Carman No. 1, Empire State, Rochester Rose. The seed used showed both scab and rhizoctonia, and was treated as follows:—

(1) Check, untreated.
(2) Soaked in corrosive sublimate $\frac{1}{2000}$ for 3 hours.
(3) Dipped in gycerine (1:10 in water) and rolled in flowers of sulphur.
(4) Soaked ten minutes in 2 oz. lime-sulphur concentrate (Niagara Brand) to 6 quarts of water.

The land was laid out in thirty-two equal plots in such a way that the eight plots of each variety ran the whole length of the area, four being on the limed and four on the unlimed portion, while the tests in seed treatment extended across the four varieties and were duplicated on the limed and unlimed portions. Each plot was planted with sixty uncut tubers May 28th to May 30th. The plants were sprayed three times with arsenicals alone and then six times with Bordeaux mixture plus arsenicals, the season being exceedingly wet.

The plots were carefully watched during the season and records made, and finally the crop was lifted October 18th.

Careful examination of the crops showed that while there was considerable variation in the yield from the different plots, owing mainly to the variable quality of the soil, there were no constant differences between the plots differently treated in regard to seed or on limed or unlimed soil respectively. The only constant differences seemed to be in varietal freedom from and resistance to disease, Carman No. 1 being almost free from rhizoctonia on the tubers, Rochester Rose showing only a very little, and Empire State and Gold Coin showing little and a good deal respectively. In the standing crop no differences between the different varieties were observed in the matter of susceptibility to the disease.

POTATO SCAB EXPERIMENTS.

Another series of experiments carried on with a view to controlling the common scab of the potato were outlined and given in charge of my chief assistant, Mr. J. W. Eastham, B.Sc. who herewith reports the results in detail:

The problem of treating land infected with the organism of potato scab in such a way that the disease will be prevented or much reduced, has for many years engaged the attention of experimenters. So far, however, no method has been found for giving such a complete or partial sterilization to the soil, as would, at the same time, be applicable and remunerative under field conditions. In view, however, of the severe attacks of scab in many parts of the Dominion, and the frequency of inquiries regarding it, an experiment was undertaken to test one or two recommendations that have been made, and to try one or two substances not previously employed in this connection, although known to be of value in controlling certain other plant diseases. It seemed that the most promising substance in this category was chloride of lime (bleaching powder), a substance which, being manufactured on a large scale for use as a disinfectant, can be purchased comparatively cheaply (2c. per lb. in 400 lb. barrels). It has, moreover, given good results on a small scale in the treatment of Club Root, (*Plasmodiophora*) of Crucifers and certain other soil troubles. In the experiments mentioned, it was applied at the rate of half a pound to a square yard, either mixed with water or worked into the soil, which was then very liberally watered. The hypochlorite, which is the active component of the bleaching powder, rapidly undergoes chemical change with the production of substances harmless to plant life, and plants may be put into the treated ground two weeks or so after treatment. As the application of the substance in suspension or semi-solution in water, or even the copious watering of the ground after its application in the dry state, would involve an amount of labour prohibitive under field conditions in most cases, it was decided simply to mix the dry powder as thoroughly as possible with the surface soil.

Sawdust sown over the 'seed' in the drills at the rate of 5,000 lbs. per acre has been stated to be very successful in preventing scab (Experiments at Leeds University, Eng., quoted by J. B. Pole-Evans in Agr. Jour. S. Africa **1**: 692-3.) As sawdust is generally easy to procure, it was thought worth while to test its value.

As sulphur has also been found of value, it was decided to use it on one plot in the usual way, *i.e.*, in the form of a fine powder sown with the sets, and also in the form of concentrated lime-sulphur solution.

The land selected for the purpose of the experiment was located at Orwell, P.E.I. The soil was loamy, in a high state of cultivation and tolerably uniform in character over the area employed. Scab had been very severe in the potato crop raised on this land the preceding season, many tubers being completely covered with the excrescences and, in the words of the proprictor, bearing more resemblance to 'toads' than to potatoes. Scab is, moreover very bad in many parts of the district owing partly to the

extensive application of 'mussel mud,' a deposit highly calcareous from the presence of numerous shells and their remains.

A set of twelve plots was laid out, each 24 yds. by 10, and having an area of one-twentieth of an acre. They were laid out in two parallel series with a path 2 yds. wide between adjacent plots and 7 yds. wide between the two series. The variety of potatoes used was Carman No. 1. Sound seed was selected and treated with formalin solution, (1 lb. in 30 gallons of water) for two hours, except where otherwise stated. It was planted at the rate of 20 bushels per acre, *i.e.*, 1 bushel per plot. Soil treatment took place on the 24th and 25th of May, except when the substance was sown with the seed and planting took place on June 5. This gives an interval of only 12 days between the two operations. This might naturally be expected to exert an injurious influence on the crop, although it could hardly vitiate the results from the point of view of scab control. Certain other matters had unfortunately prevented the soil treatment from being carried out earlier as had been intended and it was not thought advisable to defer planting till after the date mentioned. No fertilizer was applied to any of the plots.

The following are the details of the individual plots:—

1. Check. Untreated soil planted with untreated very scabby tubers.
2. 250 lbs. sawdust (*i.e.*, 5,000 lbs. per acre) sown over sets in drills at time of planting.
3. 15 lbs. sulphur (*i.e.*, 300 lbs. per acre) sown like fertilizer during planting.
4. 12 gallons commercial lime-sulphur solution diluted with water to 40 gallons and applied to the surface of the soil by sprinkling cart May 24th.
5. 24 gallons commercial lime-sulphur solution diluted to 120 gallons applied similarly, May 24th.
6. Check. Sound seed treated two hours with 1 in 1,000 mercuric chloride (corrosive sublimate) solution. Soil untreated.
7. 50 lbs. chloride of lime, *i.e.*, 1,000 lbs. per acre. Applied May 25th.
8. 80 " " " 1,600 " " "
10. 120 " " " 2,400 " " "
12. 150 " " " 3,000 " " "
9. 200 " " " 4,000 " " "
11. Check. Soil untreated. Sound seed treated with formalin.

As chloride of lime is in the form of an exceedingly fine, dry powder, intensely irritating to the mucous membrane of the nose and throat, and also to the eyes, its application proved a somewhat disagreeable operation. It was found most convenient to use buckets, determine by weighing how much they would contain, and then fill them from the barrel. Water was sprinkled over the surface of the chloride in the bucket to prevent the wind from blowing it, and the bucket taken to the plot and emptied out on the ground. More water was at once sprinkled over it, and it was then mixed with soil and spread with a shovel. As soon as all the plots were thus dealt with the chloride was worked into the soil with a tooth-harrow. Very little rain occurred between treating and planting.

The crop was raised on September 20th, with the following result:—

Check Plot 6. Yield 7½ bushels. Exceedingly scabby, no clean tubers being found, and many tubers covered with scab. The amount of scab in this plot was taken for a standard of comparison as 100.

Check Plot 1. Yield 6½ bushels. Scabbiness about 80.

Check Plot 11. Yield 7½ bushels. Scabbiness 80.

Plot 3. Sulphur. Yield 8 bushels. Scabbiness 90.

4. Lime-sulphur. Yield 7 bushels. Scabbiness 45.

5. Lime-sulphur. Yield 5⅝ bushels. Scabbiness 35. Many tubers quite clean.

2. Sawdust. Foliage exceptionally green compared with other plots. Yield 7½ bushels. The sawdust was apparently in the same condition as when applied, no decomposition being visible. A few clean tubers, but most very scabby. Scabbiness 75.

7. Yield 4 bushels. Tubers small. Vines weak and spindly. Scabbiness 80.

8. Yield 3½ bushels, otherwise much like the last.

10. Yield 2 bushels. Scabbiness about the same.

12. Yield 2 bushels. Scabbiness about the same. Stand very uneven.

9. Yield ⅞ bushel. Very few plants properly developed, and long bare spaces present in the rows where plants had not come up. Scabbiness over 80.

In examining these results, it will be noticed that the sawdust had little effect, the amount of scab being almost as high as on the best check plot. Presumably any beneficial effect it could have would be due to its decomposition, perhaps by its decomposition increasing the acidity of the soil, and therefore could hardly be looked for when so little alteration had taken place.

While no benefit was obtained from powdered sulphur there was a marked improvement where the soil was sprayed with lime-sulphur solution. The plot which received the double quantity showed rather less scab, but also a considerably diminished yield. As applied, the lime-sulphur was much diluted with water, which would, of course, increase the labour and cost of application, and no test was made with the undiluted substance, but even if the latter were just as effective, an application at the rate of 200 gallons or more per acre would be too expensive for ordinary purposes. There is also the objection that this result was obtained from a single experiment and might be due to a variation in the degree of infection of the soil or some other factor not accounted for, although, as far as could be judged, the conditions were uniform. The experiment at any rate would seem to be worth repeating.

With respect to chloride of lime, it is evident that even a comparatively small amount (200 lb. per acre) applied twelve days before planting exercised a markedly injurious action on the crop, while, on the other hand, when applied in such quantities as to render growth almost impossible, such tubers as are found are almost as badly scabbed as those on the check plots. It is, however, to be noted that little or no rain fell between the time of application of the chloride and that of planting. This would probably affect the results adversely in two ways. In the first place the germicidal constituent would not be so extensively and intimately diffused through the soil and therefore its effect on the scab organisms present would be restricted, and secondly its alteration into substances harmless to the crop would probably be slower. While the labour and cost of applying this substance in sufficient quantity in a state of suspension in water would seem to be prohibitive under field conditions, it would still seem to be necessary to try the effect of applications similar to those here given, made in the autumn instead of late spring, before concluding that it has no value in reducing scab.

It will be noticed that disinfection of the seed tubers whether with formalin or corrosive sublimate, produced no improvement in the scabbiness of the crop. This was naturally to be expected when the soil was so badly infected with the disease, but as this fact is, even now, not always recognized, it may not be amiss to call attention to it.

J. W. EASTHAM.

ERGOT.

Claviceps purpurea (Fr) Tul.

This fungus (together with one or two closely-related specimens which for our purpose need not be distinguished from it), is of importance to the agriculturist, not so much because it causes injury to the plants on which it grows, but because the resting bodies, or 'ergots,' contain substances highly injurious to the health of animals.

If a careful examination be made in late summer or fall of the ears of rye, wheat or barley, or of many grasses, *e.g.,*. couch, particularly if these are growing in damp situations, it may be noticed that in some of the florets the 'seed' is replaced by a spur-like or rounded, hard, purplish body, which is much larger than the grain would be, and consequently projects beyond the chaffy scales of the ear. These bodies are masses of resting mycelium (*sclerotia*) of the fungus and are known commonly as 'ergots.' In size they vary according to the plant on which they occur, reaching a length of an inch or more on rye and being very small on such a grass as red top *(Agrostis)*. Many species of grasses are liable to be attacked, whilst among cereals rye is most commonly affected, and to a less degree, wheat and barley. Unless harvested with the host plant, the sclerotia finally drop off and fall to the ground. Such of these as have been subjected to the right conditions undergo a new development in the following spring or early summer. From each, one to several rather stout stalks grow up into the air, reaching perhaps a length of an inch or more, each stalk terminating in a rounded purplish 'head' (*stroma*), whose surface is roughened with numerous small projections. These projections terminate in minute openings, each communicating with a separate chamber or cavity (*perithecium*) in the 'head.' At the base of each cavity is a dense tuft of elongated, somewhat club-shaped, spore-sacs (*asci*) in each of which eight threadlike spores are found. Ultimately these spores are liberated from the sacs enclosing them, and forced out through the opening of the *perithecium* into the air, to be dispersed by the wind. Should one of these spores be carried into the open flower of a susceptible grass or cereal and reach the ovary it is capable of producing a mycelium which develops in and around the ovary and which gives rise externally to large numbers of minute spores *(conidia)* together with a sweet, sticky liquid. The latter attracts certain insects to which the conidia adhere and are thus carried to other flowers. Each conidium is able to reproduce this stage of the disease, should it be brought into contact with the ovary of a susceptible plant at the right stage of development. This phase of the life-history of the fungus is so unlike the 'ergot' and the structures developed from it, that before the full life-history had been followed it was considered as belonging to a distinct species of fungus and given the generic name *Sphacelia.* It is still referred to as the Sphacelia or sphacelial stage. The mycelium, however, still continues to increase in quantity and becomes contracted, forming a mass replacing the ovary, but to the tip of which the withered-up stigmas and upper part of the ovary remain attached for some time. Conidia are no longer produced, and the outer layers of mycelium develop into a comparatively hard protective layer, the outer walls of which assume a dark purplish colour. This is now the sclerotium or 'ergot' stage similar to that with which we started.

The conditions which determine the germination of the sclerotia have not yet been fully determined, but apparently one very important factor is the degree of 'drying-out' to which they have been subjected. A completely dried-out sclerotium is commonly believed to be incapable of germination. Hence sclerotia a year or more old rarely germinate, while those kept even for a few months under ordinary warm con-

ditions appear to lose this power. This fact, no doubt, explains why, under natural conditions, ergot occurs to a much greater extent in low-lying, damp situations and in wet seasons. When the matter has been more fully investigated it may be found to have valuable practical results, since it may be possible to so treat seeds containing 'ergots' that the germinating power of these may be destroyed without injuring that of the seeds. In one of our experiments to test and study the germination of ergot that appeared in a barley plot on the Farm, the sclerotia were kept in a paper bag in the warm laboratory from harvest time (September) to May following. They were then placed in moist sand and not until October next could we observe signs of germination. The germination after this period of rest appears interesting in comparison with the above mentioned results of other investigators, who claim these grains do not germinate after completely drying-out. We also take this opportunity to place on record that we found the ascospores of this species to show three distinct septa, very prominent after careful staining. We do not know of any other record concerning this observation, which, however, is of scientific interest only. Ergot grains were submitted several times during the year and we collected some ourselves on rye, barley and wheat in the West.

As previously stated, the economic importance of ergot depends on the action upon the animal organism of certain chemical principles contained in the sclerotia. In large doses these produce contraction of the smaller blood vessels and also strong muscular contraction, which in the case of pregnant animals is liable to result in abortion. Taken for a period of time in smaller quantities the effects are very serious, among them being debility, muscular spasms and tremblings, gangrene, and the sloughing-off of portions of the extremities. Such results in the case of human beings are occasionally recorded over wide areas, where, as in parts of Continental Europe, rye-bread is an important article of food. On the other hand, various preparations of ergot find employment in medicine, its medicinal value for certain purposes being universally recognized.

Control Measures.—Seed containing ergots should not be sown, indeed the sale of such seed is an infringement of the Canadian Seed Control Act. Since only plants which are allowed to flower can become infected, it is important that the grass by road sides, etc., should be cut at intervals. If already infested with sclerotia it should be raked together when dry and burned. Since couch or twitch grass is very commonly affected, we have, in this fact, additional grounds for taking measures for the eradication of this weed. The roadsides all around Summerland, B.C., are overgrown with a tall sand grass (*Elymus condensatus*, Presl.) which we have observed to be considerably infected with ergot each year.

Where pastures have been found liable to extensive infection it would be well to cut the standing flowering-stems at intervals to prevent the development of sclerotia. Where these are already present, 'burning-over' when possible, will destroy many or most of them. It is advisable to remove stock from badly infested land, and hay or grain containing any considerable quantity of it should be destroyed rather than used for feeding purposes. The statement that ergot completely dried out has lost all vitality would be important, if true, as regards preventing its recurrence. Seed-wheat or other grain hardly suffers in vitality after two or three years' storage; in that time, no doubt, all ergot grains have lost their vitality.

BITTER PIT INVESTIGATION.

In previous reports attention has been called to the nature of this disease and its presence in Canada. In our report for last year, two papers by Dr. Jean White and Prof. A. J. Ewart, respectively, dealing with researches into this subject were noted, and it was also stated that the Commonwealth Government of Australia had taken up the matter and appointed Mr. D. McAlpine, the well-known pathologist, to devote himself

entirely to the investigation of this problem. Mr. McAlpine's first report on the work done now lies before us in the shape of a handsome quarto volume,* containg some 200 pages of text and descriptive letter press, and 35 plates with 133 illustrations of great excellence, mostly from original photographs. The work summarized included a detailed histological study of the Pome fruits, particularly with respect to the vascular system, the characteristics of the disease, a critical review of the literature on the history, distribution and hypotheses advanced in explanation of its occurrence, an analysis of the replies to a series of questions submitted to growers regarding more particularly the contributing factors, and an outline of experiments carried out and in progress. It is impossible to attempt in this place an adequate review of the phases of work taken up, but a few of the more interesting points may be noticed.

The form of the disease termed 'crinkle,' or confluent bitter pit, which is characterized by the surface of the fruit being thrown into rough folds with large cavities in the underlying tissues, is new to us, and according to the author has apparently been recorded outside of Australia only from California.

As regards the causes of the trouble, Mr. McAlpine considers that the evidence is entirely in favour of the hypothesis that it is due to irregularities in the factors influencing the balance between transpiration and water supply, and not to poisoning of cells, *e.g.*, by arsenical sprays. Both the recorded history of the disease and its presence on unsprayed trees are against the latter hypothesis. It was also found experimentally that fruit of an unsprayed tree protected from any possible contact with spray material from other parts of the orchard by being enclosed in calico bags as soon as the fruit had set was quite as badly affected as the exposed fruit of the same tree. The author sums up the matter of poisoning from the exterior as follows:— 'After testing the effects of various chemical substances applied to the skin of the apple, I cannot emphasize it too strongly that all this production of external spots and smears has nothing to do with Bitter Pit. This disease originates from within and the action of an external agent on the skin is something totally different.'

The principal contributing factors are given as follows:—

'1. Intermittent weather conditions, when the fruit is at a critical period of growth.

'2. Amount and rapidity of transpiration.

'3. Sudden checking of the transpiration at night when the roots are still active owing to the heat of the soil.

'4. Failure of supplies at the periphery of the fruit followed by spasmodic and irregular recovery.

'5. Irregularity of growth, so that the vascular network controlling the distribution of nutritive material is not regularly formed.

'6. Fluctuations in temperature when fruit is in store, and

'7. Nature of variety.'

The question of storage conditions is particularly important since the disease usually develops to a large extent in storage. It was found, however, that 'even with very susceptible varieties the development of Bitter Pit was retarded by keeping them at an even temperature of 30° — 32° F.' It is recommended 'that the apples should be picked . . . . just when they have reached their full size, and on the green side, and placed in cold storage without delay.'

We congratulate Mr. McAlpine on the work he has already accomplished and shall look forward with increased interest for the results of his experiments directed towards the control of the trouble in the growing fruit.

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* Bitter Pit Investigation. The past history and present position of the Bitter Pit question, by D. McAlpine. First Progress Report 1911-12.

A 'STORAGE' SPOT OF THE APPLE.

Apples in storage are liable to a variety of maladies which often give serious trouble and result in much depreciation in value. A case of spotting of stored apples was brought to the notice of the Division during the year and investigated by Mr. Eastham who contributes the following account:—

In the Fall of 1912 a correspondent sent in some Gravenstein apples from North Sydney, N.S., affected by a peculiar spotting, with the enquiry whether this could be due to the use of arsenate of lead as an insecticide. Later, this correspondent sent apples similarly affected from his own orchard, together with the following statement:—

'The lime-sulphur I used was made by the Niagara Spray Co., Kentville, N.S., and tests almost 32.5B. Swift's arsenate of lead was also used, about 6 lbs. to 100 gallons. As far as I know all trees were sprayed in the same way. The weather conditions were noteworthy in this respect, that following a very hot spell for ten days the 1st of July we then for the next six weeks had one of the wettest seasons on record, and consequently a very great growth of Black Spot. Only the late sprayed and well sprayed orchards escaped. You will notice no Black Spot on sample sent. I have not noticed this injury on any other apple except the Gravenstein.

I first noticed the injury in Montreal at .... The manager had just opened some barrels of N. S. Gravensteins. He said the apples were not keeping well and he had put the price down 50 cents a barrel in consequence. I asked to see them and found the apples in the top of the barrel that had stood opened the day before as a sample, covered with this rusty injury. This did not extend to the fruit further down in the barrel, and on opening other barrels it was not found, but the manager said if exposed to the air they would show it in twenty-four hours. These apples were only just beginning to ripen. The injury did not appear on my own apples home for six weeks to two months afterwards.' It was also stated that six sprayings were given.

The spots varied in size from ½ m.m. up to 5 m.m. in diameter, those of the latter size being circular, triangular or irregular. They were depressed, brown in colour, darkest in the centre round what, in many cases, appeared to be a lenticel. The smaller spots were by far the more numerous, as many as thirty-five being counted to the square centimeter but more commonly five to ten. In the case of the very smallest spots, the injury did not appear to go through the skin, the underlying tissue being sound. In the other spots, however, the underlying tissue was brown. The spots were much less plentiful and less conspicuous on the side of the apple exposed to the sun, being often hardly observable on the 'coloured' area. They seemed to be slightly more abundant at the calyx end. Where they were very numerous there was a tendency for the entire surface to show discolouration.

On December 3rd, after the apples had been placed in cold storage twenty-four hours, two similar ones were taken out and treated as follows: On one a circle 15 m.m. in diameter, was drawn in ink enclosing twenty spots, none more than half a m.m. in diameter. This apple was placed under a bell-jar and kept at the ordinary laboratory temperature which varied between 60° and 80° F. The other was similarly marked with a circle about 12 m.m. in diameter, and enclosing fifteen spots of a size similar to those of the first specimen. This apple was placed in cold storage. On December 23, none of the spots in the areas marked showed any appreciable enlargement in either of the apples. However, both apples by this time, but especially the one kept at room temperature, were badly rotted, although the rot had not extended into the areas marked. Whether the rot had started from similar spots as well as from bruises and abrasions could not be positively determined, although I think it likely.

Cultures were next made as follows: The apple was wiped, immersed for one minute in 1-1000 mercuric chloride and then rinsed in sterile water and

allowed to drain for a moment. Portions of the spotted skin were removed with sterile forceps, and the tissue underlying the spots transferred by means of sterile forceps or scalpel to Petri dishes. Tissue transfers were made from all sizes of spots from the smallest to the largest. In the former, as already mentioned, the discolouration did not always go through the skin and therefore some cultures were also made with portions of the spotted skin. One or two large spots which had been observed to be enlarging were also used, as they seemed to have started from the typical spots. Plates were poured with nutrient agar and 20 per cent potato agar. After six days the cultures taken from the enlarging spots showed a plentiful growth of mould (*Penicillium*). Those in which the skin of the apple had been used showed in some cases a growth of moulds; presumably the sterilization of the surface had not been complete. None of the other cultures, however, showed the presence of any organism nor did any develop later.

It seemed therefore from the non-enlargement of the spots when kept either at room temperatures or just above 0° C, together with the failure to develop organisms from them, that the cause was not a parasite. At the same time it seemed probable that saprophytic fungi could obtain entrance through these spots and set up rapid decay. Our correspondent evidently suspected arsenate of lead as a possible cause, and an account of a spotting of apples suspected to be due to this cause has been published. ('A new fruit spot of apple' by W. M. Scott, Phytopathology I., 32-34.) As compared with the spotting described by Scott, it would seem that the case under consideration differs in the much greater number of the spots, their small size and their absence from the 'blush' side instead of being concentrated there. If, however, the spotting is due to soluble arsenical compounds in the spray mixture, it is rather to be expected that the effect, as in this case, would be greater on the side away from the sun as evaporation would be slower and the chemical have a longer time to act. The spots being so small, a reliable comparative analysis of spotted and unspotted portions of the skin would have been somewhat difficult but an analysis of the skin as a whole, kindly made by the Dominion Chemist, Mr. Shutt, showed arsenic to be present to an average extent of ·00083 milligrams per apple.

It may seem at first sight that a spotting of the fruit which has developed in storage can hardly be due to the use of arsenical sprays applied when the fruit is not yet mature. It was shown, however, as stated, that arsenic was present on the skin of the apples when examined. It is possible, therefore, that the changes undergone by the apple in the process of after ripening may result as Waite* has suggested in the excretion of organic acids which have dissolved enough of the adherent arsenic to kill the adjacent cells. On the other hand Ewart** has shown that the pulp cells of an apple become increasingly sensitive to minute quantities of certain poisons as the fruit matures, and that the cells on the shaded side are more sensitive than those on the side exposed to the sun. He has, therefore, suggested the possibility of poisons being absorbed in minute quantities into the tissue of young apples but not producing any effect until the cells have been rendered more sensitive in the process of maturation.

At all events, while the cause of the spotting has not been demonstrated, it would seem to be of non-parasitic and external origin and to have much in common with the so-called 'Jonathan spot' which is suspected to be due to the use of arsenate of lead as an insecticide.

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* Quoted by W. H. Scott, *l.c.*

** Ewart, A. J., on Bitter Pit and the sensivity of apples to poisons. Proc. Roy. Soc. Victoria 24 (N.S.) Pt. II, 1911.

SYSTEMATIC BOTANY.

(F. Fyles, B.A.)

IDENTIFICATION OF PLANTS.

The numerous inquiries received year by year and the ever increasing number of plants sent in for classification, are sufficient evidence that the work of this branch of the Division is being appreciated by the general public. The number of specimens identified during the past fiscal year was four times that of the year ending March 31, 1910.

A large proportion of these specimens were plants of the woods in the spring and early summer, as it is very natural that such plants should attract attention. Many medicinal and poisonous plants were also received, with requests for information or literature regarding their identity and qualities. But the greater part of them consisted of weeds sent in by farmers seeking advice as to the best methods for their eradication.

WEEDS.

Those weeds most frequently sent in were:—Canada Fleabane, Sow Thistles, Field Cress, Toadflax, Orange Hawkweed, Campions, Couch-grass, Biennial Wormwood, Barnyard Grass and Cinquefoil.

The Prairie Cone-flower (*Lepachys columnaris* (Sims) T. and G.) and the Western Gum Weed (*Grindelia squarrosa* (Pursh) Dunal.), were reported from Toronto. Although this is not the first time that the latter has been found in Ontario, it is well to point out that these undesirable weeds are spreading. No doubt their increase is largely due to the transportation of commercial seeds. Such was the case in the appearance of *Bromus arvensis* L. (Field Brome Grass) and *Polypogon monspeliensis* (L.) Desf. (Beard Grass) at St. Thomas, Ont., and in regard to *Tussilago Farfara* L. (Coltsfoot) reported from St. John, N.B.

A WEED NEW TO CANADA.

The Thorny Amaranth (*Amaranthus spinosus* L.)

The Thorny Amaranth, which as far as we know, made its first appearance in Canada at St. Thomas, Ontario, last summer, is a coarse annual plant belonging to the Pigweed Family (*Amaranthaceæ*). It is a native of tropical America and has become naturalized in the north-eastern United States, where it has caused considerable damage. Like its allied species, Red-root Pigweed (*Amaranthus retroflexus* L.) and Tumble-weed (*A. græcizans* L), the Thorny Amaranth produces annually a large quantity of small, black, highly polished, lens-shaped seeds, and by this means of propagation spreads rapidly. The plant, which grows to a height of three feet or more, is very bushy in general appearance, often having as many as six stout branches from the base of the stem, varying in diameter from one-half to three-quarters of an inch. Being of rank and succulent growth, it deprives useful plants in its proximity of necessary moisture and nourishment. Farmers are advised to make a point of destroying this weed on its first appearance. It is easily distinguished from the other species of Pigweed by the rigid spines at the base of each leaf-stalk. These measure from one-

quarter to one-half an inch in length. (See illustration, plate XXI, fig. 1.) The Thorny Amaranth, like the Russian Thistle and other plants possessing sharp spines, is likely to cause much irritation to horses and to labourers working in the fields. When cut and dried with the hay and afterwards eaten by cattle and horses, the spines penetrate the mucous membrane and may cause serious inflammation.

Acroptilon Picris DC.

The bright white seeds found in Turkestan alfalfa, which have been identified as *Acroptilon picris* DC., and of which there is a short description in Bulletin 86, issued by the Seed Branch, are familiar to all seed merchants and others handling Turkestan alfalfa. But it is not so well known that this seed will produce a vigorous perennial plant, capable of withstanding the winters at Ottawa. The plant produces a long, horizontal, underground rootstock which sends up new shoots at each node. From six to ten new plants are produced by the parent plant in this manner. The stem and leaves are covered with a hoary pubescence, which gives to the plant a dull whitish-green colour. The lower leaves are long, narrow and deeply pinnatifid. The upper leaves are more sparingly and less deeply cut.

Hieracium aurantiacum L. (Orange Hawkweed) and Allied Species.

On the 27th of June, 1912, there was issued by this Division, a circular on 'Orange Hawkweed.' This circular was printed in the form of a card with a coloured illustration of the weed. A brief account of the life history of the weed, together with the best methods for its eradication, was printed in large type on the card. Forty thousand copies of these cards were published and distributed, chiefly in the Province of Quebec, where the weed is most prevalent. The difficulty of eradicating this pest may be overcome with the co-operation of the farmers. Most farmers will agree that is more readily destroyed than Couch or Twitch Grass. Paint-brush will not long exist on well cultivated and well fertilized land. Shallow ploughing, harrowing and thorough cultivation repeatedly practised throughout the autumn, followed by a rotation of crops into which hoed crops largely enter, will keep it under control. The weed thrives best on poor land and in rocky pastures which cannot be cultivated. In this case sheep will eat it close to the ground. There is no portion of Canada better suited to sheep-raising than the hilly sections of the Eastern Townships. Salt, if applied in hot, dry weather, is another sure means of killing it.

The bright red-orange flowers of this species are easily distinguished from the yellow flowers of the Many-flowered Hawkweed, and the King Devils which, although not so abundant, are, in themselves, none the less troublesome. The many-flowered Hawkweed (*H. floribundum* Wimm. and Grab.) produces leafy secondary flowering shoots as well as stolons or runners. The King Devils (*H. pratense, H. praealtum* var. *decipiens*) are of similar growth, that is, they are reproduced both by runners and seeds. The same method of treatment as recommended in the case of *H. aurantiacum* will exterminate these.

The Mouse-ear Hawkweed (*H. Pilosella* L.), which is a troublesome weed on lawns, is a shorter and smaller species. It bears a solitary, pale yellow flower somewhat resembling a small dandelion, but the close mat of small, entire leaves at the base of the flowering stalk as well as its runners, proclaim it to be a Hawkweed. Several patches of this weed in the arboretum were entirely destroyed by a single application of coarse salt.

The following weeds were sprayed with a solution of iron sulphate, 2 lb. per gallon of water:—Ox-eye Daisy, Field Bindweed, Heal-all, Dandelion and Sedum. After the third application these weeds were still living, although much of the foliage was destroyed. As the injury to the surrounding grass was greater than that to the weeds, the spraying was discontinued.

BOTANIC GARDENS.

The labelling of the native trees and shrubs in the Arboretum has been completed, and the task of re-naming and re-labelling the indigenous herbaceous perennials has been begun, fifty-two different species being already designated by the new labels with names according to Engler and Prantl—the nomenclature adopted in Gray's New Manual of Botany, the standard manual of students. This work will be particularly valuable to teachers and students, who frequently visit the gardens to study rare species and species from distant parts of Canada, which otherwise it might be impossible to examine except from dried material.

An alphabetical list of all the plants in the North and South borders was compiled with the corresponding numbers of the row and square in which each plant is to be found. It is hoped that in time a similar list may be made of the trees and shrubs.

SEED EXCHANGE.

In the summer and autumn of 1912, 433 different species of seeds were collected in the Arboretum and Botanic Garden. A list of these seeds was sent to different parts of the world, preferably to those Botanic Gardens in climates similar to our own. On request, we sent out 385 different species, and received 351 in return.

DRUG PLANTS.

As our correspondence increases, the interest in the cultivation of certain drug plants in Canada becomes more evident.

Although the cultivation of drug plants is certainly an interesting undertaking and may be a profitable one under favourable conditions, it is necessary to point out that, before entering upon any extensive work in this direction, the expenses entailed should be carefully considered. As long as the price of land and the cost of efficient labour continue to be so high, it is doubtful whether, from a commercial standpoint, it will prove successful in Canada.

Since we are frequently requested to supply information in regard to Golden Seal, the following account of it will be of service.

GOLDEN SEAL *(Hydrastis canadensis L.).*

Hydrastis canadensis L., commonly known as Golden Seal, is a low perennial herb belonging to the Buttercup family (Ranunculaceæ). It is found growing wild in rich woods in the western peninsula of Ontario. It has a thick and knotted yellow rootstock, which sends up in the early spring one radical leaf, and a simple hairy stem with two leaves near the summit, and an inconspicuous, solitary, greenish-white flower. When in bloom the plant is about twelve inches high. The leaves have not at that time reached their full expansion. At maturity they measure six to eight inches across. They are palmately 5-7 lobel, with toothed margins. The flower, which opens during the month of May, lasts but a short time. It has no petals but three sepals which soon drop off, leaving the numerous stamens and the pistils unprotected. The fruit matures in July or August. The head of small scarlet berries somewhat resembles a raspberry. The rootstock is marked by seal-like impressions made by the shoots of the previous years. These scars and its bright yellow colour have obtained for it the name of 'Golden Seal.'

Both the yellow roots and rootstock contain the valuable drug known on the market as 'hydrastin.' They are carefully washed and thoroughly dried before they are sent to market. They lose their colour and become inferior in quality with age.

Hydrastis is easily cultivated. Any good garden soil into which leaf mould has been well worked, and a shady situation will answer its requirements. It has been successfully grown on a small scale in the shade of a row of shrubs and trees in our Botanic Garden. When it is grown for commercial purposes it is better to give it artificial shade by a framework of lath such as is used in the cultivation of Ginseng.

Golden Seal is sometimes confused with Gold Thread (*Coptis trifolia* (L.) Salisb.), another perennial of the woods belonging to the same family. But, as the rootstock of Golden Seal is short, thick and knotted and that of the Gold Thread is long, slender and smooth, they are easily distinguished by these points alone, apart from other dissimilarities of growth. (See illustration Plate XXI, Figs. 2 and 3). The rootstock of Gold Thread extends horizontally near the surface of the soil thus making its deep, yellow colour conspicuous. Although Gold Thread is very bitter, it is not unpleasant and has no odour, while Golden Seal has a distinctly disagreeable odour and an unpleasantly bitter taste.

Seed Collection and Herbarium.

The seed collection and the herbarium have been added to from time to time as opportunity permitted. About 500 specimen sheets were added during the year. Specimens of the Painted Trillium (*Trillium undulatum* Willd.) were brought from Prince Edward Island, which is a new locality for this rather rare species.

Several different kinds of seeds and plants of particular interest in the seed collection and greenhouse were brought from Bermuda.

Drawn by F. Fyles.

Fig. 1—Thorny Amaranth.
Fig. 2—Golden Seal.
Fig. 3—Golden Thread.
Fig. 4—Golden Seal in flower.
(Half natural size).

FIRST REPORT FROM THE BRANCH LABORATORY OF THE DIVISION OF BOTANY, ST. CATHARINES, ONT.

BY

W. A. McCUBBIN, M.A., assistant in charge of Field Laboratory of Plant Pathology, St. Catharines, Ont.

This laboratory was established by the Division of Botany for the study of plant diseases in the Niagara District and was opened August 1, 1912.

In the beginning of this year's work, some time was necessarily consumed in fitting up the building, apparatus, and supplies, and in becoming acquainted with the conditions in the neighbourhood. For this purpose the greater part of the Niagara peninsula was visited, and every opportunity taken, of laying before the fruit-growers and farmers the purposes of the station and endeavouring to enlist their co-operation. Advantage was taken of meetings held in Grimsby, McNab, Queenston and Louth Township, by Mr. Caesar of Guelph, for demonstrating the symptoms of 'Yellows,' and 'Little Peach,' and at each of these the aims and objects of the Station were presented in a short address.

Throughout the season, a study of local diseases was carried on as fully as possible. Collections of over one hundred specimens of various diseases were made and numerous observations recorded for reference and for future experiments. An exhibit of some of the commoner and more destructive of these diseases was set up at the St. Catharines Horticultural Show in September.

Owing to the lateness of the season, experimental work was necessarily limited, but several experiments were begun, the results of which will not be apparent till next summer at earliest.

A large number of peach cankers were treated in various ways and with different materials in order to find out a cheap, simple, and effective method of dealing with this trouble, which has become quite a nuisance in several orchards here.

The currant polyporus (*Pyropolyporus ribis*), found in quite large numbers in one field, was treated with several fungicides. As far as can be ascertained as yet, formalin, copper sulphate, salt and ashes are effective in killing this fungus, which, though not common, seems to be serious enough once it infests a field.

Considerable attention was given to the 'mosaic' disease of tomatoes, which appeared in many places in this region during the summer. Certain features about the cases seen here tend to locate the trouble in the soil. Seeds of affected plants were collected and will be grown next year to make certain that, as has been claimed, the disease is not transmitted through the seed.

A series of experiments on the treatment of Yellows and Little Peach, begun last year by the Dominion Botanist, were carried on more fully this year. Conclusive results from these experiments cannot be looked for for another year at least.

About 2,000 peach stones from trees affected by Little Peach were collected, and will be planted next year to determine the germinating capacity. This work is done jointly with Mr. Caesar, Provincial Entomologist and Pathologist.

As raspberry cane blight is rather prevalent and destructive in some parts of the district, an experiment was begun on the control of this disease by spraying. All the dead and diseased canes were removed and late in the autumn the field was sprayed with Bordeaux. This spraying will be continued next spring.

A fatal case of mushroom poisoning in the city of St. Catharines and reports of several others in the vicinity led to the investigation of the cause. There appears to be an exceptionally large number of the very poisonous *Amanita phalloides* in all the surrounding woods, and this is sometimes mistaken for the edible *Lepiota naucina,* also very abundant. In order to point out the distinguishing features of these, an exhibit of them, along with other edible and poisonous fungi, was placed in a shop window with very satisfactory results.

All the meetings of the Local Fruit-Growers' Association in December and March were attended, and at each a short address was given, setting forth the work the Station purposes to carry on, and dealing with some diseases of timely interest. An address was also given in November to the Teachers' Convention at St. Catharines on the nature of plant diseases and their treatment.

W. A. McCUBBIN,
Assistant in Plant Pathology.

Dominion of Canada
DEPARTMENT OF AGRICULTURE
Dominion Experimental Farms

REPORT

FROM

THE DIVISION OF ENTOMOLOGY

For the Fiscal Year Ending March 31, 1913

PREPARED BY

The Dominion Entomologist. - - - - - - - - - - - - - - C. Gordon Hewitt, D.Sc.

REPORT

FROM THE

DIVISION OF ENTOMOLOGY

C. GORDON HEWITT, D.Sc., Dominion Entomologist.

OTTAWA, March 31, 1913.

J. H. GRISDALE, Esq., B. Agr.,
Director, Dominion Experimental Farms.
Department of Agriculture, Ottawa.

SIR,—I have the honour to submit herewith my fourth Annual Report of the work of the Division of Entomology covering the year beginning April 1, 1912, and ending March 31, 1913. A summary of the chief lines of work upon which we have been engaged during the above period has been submitted to you separately and in the present report a more detailed account of our investigations and of the depredations of those insects which were unusually abundant and injurious is given for the use of those desiring more information on the subject.

The most notable advance in our work during the past year has been the extension of our sphere of investigation and assistance by the establishment of field laboratories in certain of the provinces. The existence of many pressing problems which could only be investigated in the regions in which they occurred, rendered this development necessary. The expansion of our organization in this direction has not only enabled us to commence a series of thorough investigations on certain insect pests, which will be specified later, but it has placed the Division in direct contact with the farmer and the fruit grower with the result that our officers located at the field laboratories are able personally to advise enquirers in regard to injuries due to insect pests, and by their attendance at meetings to interest farmers in methods of insect control. Still more important is the fact that on the receipt of reports of serious injuries we are able in many cases to instruct our field officer in the particular district to visit the farmer, investigate and if possible advise. The value of such immediate and personal contact between the Division and the farmer is only too evident; it is the most helpful form of assistance we can render. The appreciation with which this extension of our work has been met and the valuable results already obtained indicate the desirability of a continued development of the policy.

For the sake of convenience the report of our work may be considered under the following sections:—

1. The Administration of the Destructive Insect and Pest Act, including:
   (*a*) Inspection and fumigation of imported nursery stock, etc.
   (*b*) Field work against the Brown-tail Moth and parasite work.
2. Insects affecting field crops.
3. Insects affecting fruit crops.
4. Insects affecting forest and shade trees.
5. Insects affecting domestic animals and man.
6. Insects affecting garden and greenhouse.
7. Apiculture.
8. Miscellaneous.

I. ADMINISTRATION OF THE DESTRUCTIVE INSECT AND PEST ACT.

(*a*.)—The Inspection and Fumigation of Imported Nursery Stock.

During the importation season of 1911-12 over 3,800,000 trees and plants imported into Canada were inspected. In order to indicate the importance of this inspection work and the need for constant vigilance I may mention the discovery by our officer at Vancouver during the inspection work, early in 1912, of eight egg masses of the Gipsy Moth (*Porthetria dispar*) in an evergreen (*Thuja*) from Japan. Before the egg masses reached the Department several hundred of the larvæ had emerged. European shipments, we are pleased to note, are remarkably free from Brown-tail Moth infestation owing largely, no doubt, to the marked improvement in the inspection of the nurseries in Europe. Scale insects, woolly aphis and certain other species of insects are still too common on imported nursery stock, and there are several serious pests from which we are as yet free but by which we are menaced. These demand that careful attention shall be paid to our imported trees and plants.

On learning of the wide distribution and prevalence of the Mediterranean Fruit Fly (*Ceratitis capitata*) in the Hawaiian Islands, from which fruit is imported into Canada, a full inquiry was made as to the possibility of its introduction into Canada, and being convinced that its presence in those islands constituted a menace, the importation of all non-canned fruit from the Hawaiian Islands was prohibited by the passing, on April 19, 1912, of Regulation No. 16, under the Destructive Insect and Pest Act.

For some time considerable apprehension had existed concerning the possibility of the importation of the egg masses of the Gipsy Moth on forest plant products, such as logs, rough-timber, etc., from the infested New England States. No regular inspection service existed there, but upon the organization of the Federal Horticultural Board of the United States Department of Agriculture and the enactment by the Board of a regulation requiring the inspection of such forest plant products, the following Regulation No. 17 was passed in December, 1912, a slight amendment being made in February, 1913:—

> *Regulation 17.*—Forest plant products, including logs, tan bark, posts, poles, railroad ties, cordwood and lumber originating in any one of the States of Maine, Massachusetts, New Hampshire, Connecticut and Rhode Island, five of the United States of America, shall not be admitted into Canada unless such forest plant products shall be accompanied by a certificate showing that they have been inspected by the United States Department of Agriculture and found free from the Gipsy Moth. Each shipment shall be accompanied by such an inspection certificate, and the certificate shall accompany the bill of lading, way-bills or other memoranda pertaining to such shipments.
>
> The importation of coniferous trees, such as spruce, fir, hemlock, pine, juniper (cedar) and arbor-vitæ (white cedar) or foliage thereof, and decorative plants such as holly and laurel known and described as "Christmas greens" or greenery, from the States of Maine, Massachusetts, New Hampshire, Connecticut and Rhode Island, is prohibited.

The prohibition of the importation of coniferous trees from the infested States was rendered necessary owing to the practical impossibility of inspecting them with any degree of certainty.

(*b*.)—Field Work against the Brown-tail Moth and Parasite Work.

In my last annual report I referred to the increased area of infestation of the Brown-tail Moth in New Brunswick. The scouting work in New Brunswick, of which Mr. J. D. Tothill had charge and which was concluded in the spring, but after

the beginning of the present fiscal year, showed that seven counties, namely, Charlotte, Carleton, York, Sunbury, Queens, Kings and St. John, were included in the infested area. The area of infestation had increased from about 400 square miles, in 1910, to approximately 6,400 square miles in 1911. The light character of the infestation may be gathered from the fact that over this area only 2,452 winter webs of the Brown-tail Moth were found. The distribution of the webs were as follows:—

	Webs.
Charlotte county	1,812
Carleton county	16
York county	300
Sunbury county	256
Queens county	58
Kings county	8
St. John county	2
Total	2,452

The following list indicates the distribution of the winter webs on the food plants in New Brunswick during the season 1911:—

Apple	2,196	Maple	11
Bilberry	80	Oak	2
Thorn	73	Beech	2
Choke cherry	45	Pear	1
Elm	15	Willow	1
Plum	13	Poplar	1
Pennsylvania cherry	12		
		Total	2,452

The discovery of winter webs on low-growing vegetation, such as bilberry, thorn and choke cherry, increases the difficulties of our control work in New Brunswick, where the topographical and other conditions differ very materially from those occurring in Nova Scotia. In New Brunswick it was found that birds had directly and indirectly contributed to the destruction of hibernating larvæ, directly by the actual destruction of the larvæ and indirectly by opening the winter webs and thereby subjecting the young larvæ to the weather conditions from which they are usually more protected. The distribution of the agricultural lands in the southern section of New Brunswick affects the distribution of the moth. The infestations occur on the cultivated high lands, or ridges, the intervening valleys being wooded. This is shown by the nature of the chief food plants, apple on the farms, and bilberry, thorn and choke cherry on the cultivated portions of high lands. A count which Mr. Tothill made of the larvæ contained in 121 winter webs gave an average of 175·8 larvæ per web. This is less than the average.

Mr. G. E. Sanders had charge of the scouting work in Nova Scotia, and the infested region was covered by three parties of men with the co-operation of the provincial Department of Agriculture, as was also the case in New Brunswick. It was found that the area of infestation has spread eastward, a single nest being found at Brooklyn, Kings county. Altogether, 7,703 webs were collected, as compared with 4,490 collected in the season 1910-11. Considerable improvement had resulted in certain sections from the thorough scouting work which had been done in the previous season, 1910-11. In Weymouth, 562 webs were collected, as compared with 1,511 in the previous season. On the other hand, one or two localities showed an increase. In Bridgetown, 1,362 webs were collected; in 1910-11, 601 webs had been found. It should be pointed out, however, that the number of webs collected may not accurately indicate the infestation, as in many cases the webs are collected and destroyed by the owners of the properties An increase in the number in any locality might be due to the neglect of the owners of the infected trees to remove the nests.

During the spring, the notice reprinted on the next page, was sent to all post offices, and copies printed on cotton were posted in prominent places throughout the infested territory in Nova Scotia and New Brunswick.

The following list indicates the distribution of the winter webs on various food plants in Nova Scotia during the season 1911-12:—

Apple	6,842	Sweet cherry	5
Plum	274	Apricot	3
Thorn	241	Beech	3
Pear	181	Willow	3
Wild pear	68	Wild cherry	2
Elm	32	Birch	1
Maple	18	Rose	1
Oak	16		
Quince	13	Total	7,703

IMPORTATION OF PARASITES, ETC., OF THE BROWN-TAIL AND GIPSY MOTH.

The arrangements forecasted in my last annual report for the establishment of a field station in New Brunswick for the purpose of introducing and colonizing certain of the natural enemies of the Brown-tail and Gipsy Moths were completed, and the University of New Brunswick not only most kindly allowed us the use of the site for our laboratory in the university grounds at Fredericton, N.B., but also permitted us to occupy one of their large laboratories during the summer vacation, which greatly facilitated our work at a time when additional space for the breeding trays was required. Dr. L. O. Howard, Chief of the United States Bureau of Entomology again most courteously permitted us to obtain supplies of the Tachinid parasite *Compsilura concinnata* Meign, and the predaceous beetle *Calosoma sycophanta.*

Mr. J. D. Tothill, who had charge of the parasite work in New Brunswick, visited Massachusetts in July, 1912, and collected over 12,000 caterpillars of the Gipsy Moth, from which 2,395 specimens of *Compsilura* were obtained. This lot of material was used to establish two strong colonies of the insect, one near Fredericton and the other near St. Stephen, N.B., both colonies being liberated under excellent conditions. Subsequent examination of the puparia indicated that about seventy-five per cent of the flies had successfully emerged. In the case of the Fredericton colony, Mr. Tothill made an observation of considerable interest and value. Collections were made later in the season of the caterpillars of the Fall Webworm (*Hyphantria cunea*) and the larvæ of the Tachinid *Compsilura* were obtained from caterpillars of *H. cunea,* collected at a point three miles, as the crow flies, from the point where the parasites were liberated, demonstrating that the female Tachinid in flying this distance had crossed the river St. John, three-quarters of a mile wide. This discovery would appear to augur well for the future dispersal of the species.

Through the kindness of Mr. A. F. Burgess, in charge of the Gipsy Moth parasite work in the New England States, a collection of eighty adult *Calosoma* beetles was made in Massachusetts and sent to our laboratory at Fredericton. They were received in excellent condition, and Mr. Tothill immediately commenced breeding work, but was handicapped by the cold and wet season which rendered the large amount of food supply, consisting of living caterpillars, difficult to obtain. However, Mr. Tothill was successful in rearing a sufficient number of *Calosoma* larvæ to enable an experiment to be made with a view to ascertaining whether the pupal stage of *Calosoma* is able to pass the winter under New Brunswick conditions. Adults were also allowed to go into hibernation at Fredericton, and a small colony of about fifteen pairs of adults was liberated at St. Stephen, N.B. If encouraging results are obtained from these experiments during the coming spring, it is proposed

Dominion Entomological Field Station, Agassiz, B. C.

Dominion Entomological Field Station, Bridgetown, N. S.

IMPORTANT NOTICE

In view of the alarming increase of

THE BROWN-TAIL MOTH

in this region, and the necessity of taking immediate steps to control this most serious pest of orchard, shade and forest trees, the attention of all farmers, fruit growers, and other occupiers of premises upon which fruit and other trees exist. is called to the following Regulation issued under "The Destructive Insect and Pest Act":

REGULATION 8. "Any inspector entering any lands, nursery or other premises where there is reason to believe that any of the insects, pests or diseases hereinafter specified are or may be present, shall give instructions for the treatment or destruction of any tree, bush, crop or other vegetation or vegetable matter or the containers thereof, which may be found or suspected to be infested with any of the insects, pests or diseases hereinafter specified, and such instructions shall be carried out by the owner or lessee of the infected or suspected vegetation, vegetable matter, or containers thereof, and such remedial treatment shall be carried out and continued until the insect, pest or disease shall be deemed by the inspector to have been exterminated."

Under this Regulation it will be necessary for all owners of trees, upon which nests of the Brown-tail Moth occur, to remove such nests and burn them and, in the case of heavily infested trees and vegetation, to spray such trees or vegetation in strict accordance with the instructions given by the Department's Inspectors.

PENALTY:

Section 8 of the Act states:

"Every person who contravenes any provision of this Act, or any regulation made thereunder, shall be liable, upon summary conviction, to a fine not exceeding one hundred dollars, or to imprisonment for a term not exceeding six months, or to both fine and imprisonment."

GEO. F. O'HALLORAN,
Deputy Minister of Agriculture.

Department of Agriculture,
Ottawa.

to conduct more extensive breeding experiments at the Fredericton laboratory during next summer (1913).

In addition to the aforementioned work, Mr. Tothill commenced an exhaustive study of the parasitism of the Forest Tent Caterpillar (*Malacosoma disstria*) and the Fall Webworm (*Hyphantria cunea*), one of the chief objects of which was to discover what facultative parasite of the Brown-tail and Gipsy Moths were attacking these common native insects. It is also proposed to make a study from year to year of these native parasites of these common insects with a view to elucidating some of the complex problems associated with the important subject of the natural control of insects. A large amount of valuable information was obtained in the short season during which the work was carried on.

II. INSECTS AFFECTING FIELD CROPS.

CUTWORMS.

The most serious of the insects affecting field crops during 1912 have undoubtedly been cutworms of various species. In southern Alberta their depredations were very extensive and unusually severe. With a view to ascertaining the extent of the injuries and of the infested territory in Alberta, inquiries were addressed to farmers and individuals reporting injuries, and the co-operation of the crop-reporting agencies of the Census and Statistics Branch of the Dominion Department of Trade and Commerce, the Department of Agriculture, of Alberta, and of the Commission of Conservation was secured. Mr. W. H. Fairfield, Superintendent of the Experimental Farm at Lethbridge, also very kindly collected statistics. From all these sources it was found that between 30,000 and 35,000 acres of grain were actually destroyed by cutworms in southern Alberta during 1912. The most seriously infested districts appeared to have been Lethbridge, Macleod, Monarch, Pincher Station and Claresholm. The infested area was found to extend, approximately, from Claresholm in the northwest to Wagner in the southwest, and from Spring Coulee in the southwest to Turin on the northeast. They were particularly destructive to garden crops, including cabbages, turnips, onions, peas, beets and carrots, and in addition to destroying wheat, which was the chief crop attacked, they ate oats, barley and timothy. The damage was reported to have commenced about the middle of April and to have extended into the middle of June. The most destructive species appeared to be *Prosagrotis delorata* Sm. and *Euxoa ochrogaster* Gn. The ordinary remedial measures for cutworms did not prove effectual, and on this account, together with the fact that one of the species (*P. delorata*) was a new pest, arrangements have been made for a thorough investigation into the outbreak. For this purpose a field officer (Mr. E. H. Strickland) has been appointed, and an entomological laboratory will be established at Lethbridge.

CHINCH BUG INVESTIGATION.

Owing to the extensive damage by the Chinch Bug (*Blissus leucopterus* Say) in Middlesex county, Ontario, during 1911, to which reference was made in my last annual report, and the possibility of this very injurious pest of staple grains spreading from the infested area in western Ontario, a careful investigation was carried on by Mr. H. F. Hudson at a temporary field station at St. Ives, Middlesex county, Ont.

In the early part of the year, our field officer, Mr. G. E. Sanders, visited the region and made observations on the insects in winter quarters. Mr. Hudson commenced work about the middle of May, when the bugs were mating. A study of their life-history and habits was made. The infested region is largely devoted to

pasture, with some hay land; it covered about five square miles, embracing about 1,800 acres. Meadow grasses suffered most, particularly timothy. Wheat, corn and oats were slightly injured, but only where such crops were adjacent to a meadow or pasture. The restricted nature of the infestation appeared to be due to the scarcity of grain crops and the succulent nature of the grasses. The value of regular systems of crop rotation was demonstrated by the scarcity of Chinch Bugs in such land compared with their abundance on the grass farms. Under the present system of grass farming, which appears to be the result of economic conditions rather than desire, the Chinch Bug injury is likely to increase unless the region should be favoured with an open winter or a wet summer, as heavy rains occurring during the time the bugs are hatching is inimical to the progress of the pest. The season of 1912, fortunately, materially reduced their numbers. It was also found that the white fungus *Sporotrichum globuliferum* appeared in September after the wet season and killed off about twenty-five per cent of the bugs. Experiments on this fungus were carried out. The most important measures to be adopted are clean farming and the adoption of regular rotations. Clean farming includes the destruction of rubbish, the cleaning up of fences, etc., and the burning over of waste places as late as possible in the fall to destroy the hibernating places and to expose the bugs to the rigours of winter. It is intended to publish the results of the investigation as soon as may be practicable.

During the year, Mr. G. E. Sanders has found the Chinch Bug sparingly in the Annapolis valley in Nova Scotia, where, however, it is unlikely to become a pest.

EELWORMS.

In September, 1912, injured wheat plants were received from Raymond, Alta. In these plants no sign of insect or fungus injury could be discovered. A microscopic examination, however, disclosed the presence of numerous nematodes, commonly called Eelworms, at the base and along the lengths of the stems of the plants. So far as we are aware, this is the first record of injury to staple crops by these pests in North America. While they are not insects, but belong to the large family of worms, the entomologist is usually called upon to give them his attention. They are microscopic, thread-like, transparent creatures measuring, when full-grown, about one twenty-fifth of an inch in length. Further inquiries were made and it was found that Eelworms were present in other districts in southern Alberta, their injuries having been attributed to other obscure causes such as climatic or soil conditions. Winter wheat was chiefly affected. In Europe, where the Stem Eelworm, *Tylenchus devastatrix,* is responsible for serious injury to crops, such as wheat, oats, clover, hops and onions, when it occurs in numbers, infestation of wheat is not common and spring wheat is most frequently attacked. In oats, a condition known as 'tulip root' is produced.

As these pests will undoubtedly spread, and are very difficult to control, careful attention is being given to their occurrence with a view to planning a detailed investigation as soon as practicable. In Europe, the control measures usually recommended are the careful selection of rotations, the sowing of a crop which appears to be immune, such as barley, the planting of trap crops, the use of fertilizers, such as sulphate of potash and nitrate of soda, the dressing of the land with lime, salt, etc., deep ploughing and the destruction of infested crops. Many control measures practised in England, France and Germany are impracticable in Alberta, and the whole problem will demand careful investigation and experiment under our western conditions.

MISCELLANEOUS REPORTS.

White Grubs (*Lachnosterna*) were very abundant in certain parts of Ontario. This was expected, as the adult beetles occurred in enormous swarms in the spring of 1911, in which year the eggs would be laid. One correspondent reported as many as thirty grubs from one hill of potatoes, and fifteen to twenty grubs were quite common.

Wireworms were reported from every province. They destroyed potatoes and root crops universally; in Ontario, Manitoba and Alberta they destroyed both winter and spring wheat, and oats and clover were also attacked. Mr. H. F. Hudson, our field officer in western Ontario, was instructed to study their habits and depredations with a view to future work. The Seed Corn Maggot (*Pegomyia fusciceps*) was unusually injurious in Ontario.

Our investigations on the control of Root Maggots were again continued in the insectary grounds at Ottawa.

III.—INSECTS AFFECTING FRUIT CROPS.

The establishment, during the past summer, of field laboratories in most of the provinces has enabled us to begin investigations on the more important of the insect pests affecting both orchard trees and small fruits.

INVESTIGATIONS IN NOVA SCOTIA.

In Nova Scotia, a laboratory (illustrated herewith) has been established at Bridgetown, N.S., with Mr. G. E. Sanders in charge. A ten-acre orchard has been placed at our disposal for experimental work in spraying by Mr. R. S. Eaton, for whose co-operation we are indebted, at Kentville, N.S., where a series of experiments on the control of the Bud-moth, *Spilonota ocellana,* was begun; conjointly, the control of the Codling Moth and of the Green Fruit Worm, *Xylina* spp., is being studied. It has been found that more than one species of Budmoth occurs, and that the spray usually recommended for this insect does not control it. A larger species, *Olethreutes frigidana* Pack., not previously regarded as of economic importance, was found to be injurious. The value of spraying and cultivation in the control of the Green Fruit Worms, *Xylina* spp., chiefly *X. bethunei,* was investigated. In certain sections these insects are responsible for a marked proportion of damaged fruit. The first occurrence of the Apple Maggot, or Railroad Worm (*Rhagoletis pomonella*), in Nova Scotia, was discovered at Smith's Cove, N.S. It appears to be localized, and the infestation in the affected orchard is light.

SAN JOSÉ SCALE IN NOVA SCOTIA.

Not the least important of Mr. Sanders' work was the discovery, for the first time, of living San José Scale (*Aspidiotus perniciosus*) in Nova Scotia on nursery stock imported from Ontario. The first case was discovered in the spring of 1912, at Aylesford, N.S., during the Brown-tail Moth scouting work. We immediately notified Prof. M. Cumming, Secretary for Agriculture for Nova Scotia, of the fact, and arrangements were made without delay for the inspection by the Provincial Government of all Ontario nursery stock planted during the years 1910, 1911 and 1912, and Mr. Sanders had charge of the provincial force of inspectors. Regulations were passed by the Provincial Government under their *Insect Pest and Plant Disease Act* to meet the requirements of the situation, and practically the whole of the west-

ern fruit belt was inspected, from Hants county in the east to Yarmouth county in the west. The infected properties were scattered over about 175 miles of territory. The following indicates the extent and result of the work:—

Number of properties inspected..	1,758	
Number of trees inspected (over)..	157,065	
Number of properties infested with scale, living or dead..	785	
Number of trees of 1910 planting destroyed..		7
" " 1911 "		345
" " 1912 "		341
Total of trees destroyed..		693

Living scale was found as follows:—

On trees of 1910 planting, on 3 properties.
" 1911 " 71 "
" 1912 " 127 "

The fact that, altogether, living scale was found on 201 properties, on trees planted from 1910 to 1912, indicates the great importance of this discovery and the wisdom of taking immediate action. In October, 1912, the Provincial Government of Nova Scotia passed regulations requiring certificates that the nurseries from which Canadian* nursery stock imported into the province had been inspected between June 15 to September 15, and the regulations further provided that such nursery stock should be fumigated in fumigation houses established at Truro, N.S., and Digby, N.S. Most of the Canadian nursery stock imported into Nova Scotia originates in Ontario nurseries. Under the regulations of the Ontario Government, the fumigation and inspection of nursery stock is already provided for, so that the regulations of Nova Scotia will facilitate the enforcement of such necessary requirements. The Provincial Government of Nova Scotia proposes to make a thorough inspection of the entire fruit belt during the coming summer (1913). It is not improbable that the immediate steps which are thus being taken to eradicate the infection will prevent the scale from spreading and in the end, prove successful.

INVESTIGATIONS IN QUEBEC.

A field laboratory was established, after consultation with the Quebec Pomological Society, at Covey Hill, Quebec, in the orchard of Mr. G. B. Edwards, for whose co-operation and interest we are indebted. As it was not possible to commence work until the latter part of July, little more than a beginning could be made. Nevertheless, Mr. C. E. Petch, our field officer who was placed in charge, succeeded in initiating one or two investigations on important fruit insects in that region, in addition to collecting a good deal of information of a miscellaneous character on the insects affecting fruit and fruit trees The four most important orchard pests in the district are the Apple Maggot (*Rhagoletis pomonella*), Codling Moth (*C. pomonella*), Plum Curculio (*Conotrachelus nenuphar*) and the Apple Curculio (*Anthonomus quadrigibbus*). Owing to the fact that our knowledge of the last-named insect, *A. quadrigibbus*, which is a serious apple pest in European countries, has received little attention on this continent compared with the other insects mentioned, it was decided to pay particular attention to a study of its life-history and control. concurrent obser

*Nursery stock imported into the province from countries outside Canada is already governed by the Dominion Regulations under *The Destructive Insect and Pest Act.*

vations being made on *R. pomonella* and *C. nenuphar.* The chief injuries of the Apple Curculio are inflicted by oviposition and feeding. The egg punctures cause hard green core-formations extending sometimes to the centre of the apple. The egg punctures are responsible for malformed apples. A good beginning was made in the study of the life-history and feeding habits, and of the varieties attacked.

INVESTIGATIONS IN ONTARIO.

At the entomological station at Jordan Harbour, Ont., the establishment of which was mentioned in my last annual report, Mr. W. A. Ross, the officer in charge, continued his investigations on the Apple Maggot (*Rhagoletis pomonella*). In this work, Mr. Charles Good, working under the direction of Mr. L. Cæsar, Provincial Entomologist, co-operated with Mr. Ross. In spite of the very adverse weather conditions during the summer, an extended series of valuable observations was made on the following: Emergence and behaviour of adults, oviposition and incubation of eggs, mortality of eggs and larvæ, the relative value of various baits and repellants, spraying with sweetened arsenicals, cultural methods of control, the use of soil fumigants, the varieties of apples affected and the emergence of larvæ from different varieties as affecting the destruction of fallen fruit, and natural hosts, etc. Many of the experiments gave indifferent results, but the unreliability of ploughing under pupæ, among other things, was clearly demonstrated. An interim report of this work is being published (in the *Forty-third Annual Report, Ent. Soc. Ontario*), and the investigations will be continued during the coming season (1913).

INVESTIGATIONS IN BRITISH COLUMBIA.

During the summer, Mr. R. C. Treherne was located at a temporary field station at Hatzic, B.C., in the Fraser valley. Mr. A. Brealey, of Hatzic, most kindly provided us with working accommodation and facilities for experimental work. An investigation was undertaken of the life-history and control of the Strawberry Root Weevil (*Otiorhynchus ovatus*) which is one of the most injurious of the small fruit pests in that region of the province, where it is abundant. The death of the plants is caused by the girdling of their roots by the larvæ. As a rule, the strawberry fields do not suffer until the spring of the second year after planting. Extended observations were made on the biology of the weevil. The inability of the beetle to fly suggested methods of preventing their migration to uninfested plots, and a number of obstructive devices are under trial. The effect of crop rotation and cultural methods are also being studied in conjunction with the prevailing local cultural practices. Mr. Treherne made observations on a number of the insects, injurious locally, and answered enquiries in regard to the same. The Western Tent Caterpillar (*Malacosoma erosa*) was responsible for extensive defoliation of apple trees in the Fraser valley. Elater beetles appear to be responsible for injuries to the buds and blossoms of apples. A large number of insects of economic importance are awaiting study, and the varied climatic and soil conditions in the province will provide us with abundant material for investigation.

As headquarters for our entomological work in British Columbia, an entomological laboratory (illustrated herewith) has been built on the Experimental Farm at Agassiz. It contains a working laboratory, insectary, living room and store-room, lavatory, etc., all of which will provide us with much needed accommodation for our work and for the officer in charge.

IV.—INSECTS AFFECTING FOREST AND SHADE TREES.

The appointment of Mr. J. M. Swaine as Assistant Entomologist to take charge of Forest Insect Investigations enabled us to extend our studies in this most important branch, and Mr. Swaine has devoted his whole attention to this work, studying, in particular, the Bark Beetles (*Ipidae*) which constitute the most deadly and widespread enemies of our forests. In May, 1912, Mr. Swaine visited the Riding Mountain Forest Reserve in Manitoba. The primary object of his visit was to colonize a large collection of the cocoons of the Larch Sawfly, *Nematus erichsonii* containing its parasite *Mesoleius tenthredinis*. These cocoons had been collected in the English Lake district, which I visited with that object, as mentioned in my last annual report. The weather conditions were not very favourable; nevertheless, the parasitized cocoons were distributed by Mr. Swaine in two large tamarack swamps in the Riding Mountains east of Clear lake. It was found that bark beetles were present in the reserve in great numbers in fire-injured timber and in slash from cuttings. *Dendroctonus murrayanæ* Hopk. had destroyed some timber. *D. simplex* was very numerous in dead and standing larches, and is no doubt serious as a co-destructive agency with the Larch Sawfly. *Ips perturbatus* Eichh. and *I. caelatus* Eichh. were abundant in fire areas south of Clear lake, occurring chiefly in white spruce which was badly injured by fire. *Polygraphus rufipennis* Kirby was found common everywhere in dying bark of spruce, larch and jack pine. These were the chief species of bark beetles found and they are able to kill weakened or injured trees which might otherwise recover. Timber beetles of several species were plentiful, the most common being the Poplar Timber Beetle *Trypodendron retusis* Lec. and the Spruce Timber Beetle *T. lineadas* Ratz. in spruce and pine. The effect of *Pissodes* injury was very noticeable in numerous, "double tops" on the spruce.

A visit was made by Mr. Swaine to Algonquin Park, Ont., in July. Abundant evidence of serious injury by bark beetles was found. Observations on the habits and life histories and collections were made of the following: *Dryocoetes eichoffi* Hopk. on birch, *Dendroctonus* and *Dryocoetes* in white spruce, *Polygraphus rufipennis* in white and black spruce, *Ips balsameus* on balsam, *Monohammus scutellatus,* etc. The timber limits of the Canada Paper Co., at Stoke, Que., were also visited and important observations were made on the bark beetles and other forest insects prevalent in this important forest region of Quebec.

TENT CATERPILLARS.

Malacosoma americana and *M. disstria* were very abundant in certain parts of Ontario, Quebec and New Brunswick, and particularly in the districts around Ottawa and Montreal. *M. disstria* was responsible for extensive defoliation of forest trees in the Gatineau region, north of Ottawa. The caterpillars were so numerous that the trains on the Gatineau branch of the Canadian Pacific Railway were held up on certain of the grades, in spite of double engines and mechanical devices for clearing the rails. Very few parasites were found, and, although the bacterial diseases were evident, the countless numbers of moths which deposited their egg masses thickly on the trees indicate a more serious visitation next year, and a circular on Tent Caterpillars has been prepared by Mr. Swaine, and is now in the press.

The Spruce Budworm, *Tortrix fumiferana,* appears to be gradually spreading eastward, as more reports have been received from the region south and east of the St. Lawrence, and it is more in evidence in New Brunswick. Districts in Quebec, north of Ottawa, which were seriously defoliated in 1909, appear to have recovered

from the attacks, and no cases of fatal injury have been discovered which could be ascribed to this insect, which is still under investigation.

Various species of scale insects have been recorded as injurious and are under observation, *Chermes similis* Gillette and *C. abietis* Chol. have been destructive to shade trees and are very common locally in spruce forests. *C. pinicorticis* Fitch is common and destructive throughout eastern Canada. *C. strobilobius* Kalt, was particularly abundant at Ottawa on both European and American larches. *Gossyparia spuria* Mod. is proving injurious to elms at Ottawa.

In Nova Scotia, the Larch Case-bearer, *Coleophora laricella,* is still very abundant; at Ottawa it was particularly prevalent on American and European larches.

Among other insects affecting forest and shade trees which were more noticeably abundant, and reported during the year of 1912, were the following: *Galerucella decora,* stripping willow and poplar in Manitoba, Saskatchewan and British Columbia; *Podosesia syringæ* Harris destroyed stems of lilac at Ottawa; *Cyllene robiniæ* Forst. was destructive to acacias in Southern Ontario; *Elaphidion villosum* was responsible for extensive injuries to oaks in some of the St. Lawrence Island parks. *Saperda* spp., including *S. calcarata,* a very destructive enemy of poplar, were responsible for numerous complaints from Ontario and Manitoba. *Agrilus anxius* still continues to be a very destructive enemy to imported white birches around Ottawa. and in certain other eastern cities. where it is gradually killing the finest trees.

V.—INSECTS AFFECTING DOMESTIC ANIMALS AND MAN.

ROCKY MOUNTAIN SPOTTED FEVER TICK, *Dermacentor Venustus Banks.*

The occurrence of this tick in the Western States of the Union just south of the international boundary, and an isolated record of its capture at Kaslo, B.C., made it extremely desirable that a study of its distribution in Canada should be made, in view of the fact that it is the potential carrier of the fatal disease, from which it takes its name, especially prevalent in the Bitter Root valley, Montana. Accordingly, in November, 1911, through the co-operation of the Veterinary Director General, a letter was addressed to all the western veterinary inspectors, to the Farmer's Institutes, to local entomologists, and others, requesting the collection of ticks. Mr. J. W. Cockle, of Kaslo, B.C., was particularly active on our behalf, and rendered valuable assistance. As a result of this inquiry an excellent quantity of material was received from southern British Columbia, and also from Pincher Creek, Alta. The chief area of distribution of this species appears to be the Kootenay region, where they are found on the mountain sides; specimens received were taken from horses, grizzly bears, and man; they were also found on forest undergrowth, on which account they have no doubt received the popular name "wood ticks," which name also includes *D. albipictus.* Evidence collected indicates that this species may be responsible for paralytic symptoms in children and somewhat obscure petechial outbreaks. Observations were made in the laboratory on the oviposition, but attempts to get the ticks to feed on chipmunk and guinea pigs failed, and my absence in England resulted in the death of the seed ticks. The fact that the bites of these ticks undoubtedly have serious results, points to the necessity of avoiding their bites in the infested region.

THE STABLE FLY, *Stomoxys Calcitrans.*

On account of the possible relation of this biting fly to poliomyelitis, or infantile paralysis, which the experiments of Drs. Rosenau, Brues, Anderson and Frost have recently indicated, and also its character as an occasional pest of domestic animals,

the experiments, which I began originally in 1906, were resumed. Not only was the life history studied, but special attention was paid to the feeding habits of the adult, several flies being fed entirely on human blood.

WARBLE AND BOT FLIES.

During the summer of 1912, Dr. S. Hadwen, of the Health of Animals Branch of this department, carried out a valuable series of experiments on the Warble fly *Hypoderma bovis* de Geer, the account of which has been published in Bulletin No. 16 of that branch. The chief interest in Dr. Hadwen's study lies in the fact that previously it had generally been supposed that this European species was not positively known to occur in North America, but that our only species of Ox Warble fly, or Bot fly, was *Hypoderma lineata* de Villiers. At Agassiz, in British Columbia, Dr. Hadwen found *H. bovis* was the common species. In going over the collections in the Division, I find that we received this species in July, 1911, from St. Henri de Lévis, Que., an adult specimen having been taken from the hoof of an ox. We have also received the larvæ of *H. bovis* from Saskatchewan. These facts would indicate that *H. bovis* is generally distributed through Canada.

The Sheep Nasal Fly (*Oestrus ovis*) was reported as becoming a pest on Salt Spring Island, B.C. Specimens of the larvæ of *O. ovis* were also received from the biological laboratory of the Health of Animals Branch; they had been taken from the head of a sheep received from Quebec in April, 1912.

VI.—INSECTS AFFECTING GARDEN AND GREENHOUSE.

Mr. W. A. Ross is carrying on at the present time at London, Ont., a series of experiments on the control of Sow bugs (*Oniscus* sp.) which are particularly injurious to florists' stock in greenhouses. Various kinds of repellents and poisoned baits are being tried, and the effect of soil fumigation and sterilization of the soil is being studied. One of the most important factors in the control, and one which is apparently least observed, is cleanliness and tidiness in and around the greenhouse and the benches.

A series of experiments on the fumigation of greenhouses for the control of White fly (*Aleyrodes*) is also being carried out.

VII.—APICULTURE.

Until the end of September, 1912, the apiary was under the care of Mr. J. I. Beaulne, who had managed the practical apiculture in a satisfactory and successful manner since the summer of 1910. The necessity of extending the apiculture work, and the great need for experimental work on the breeding and nesting of varieties and strains of bees suited to our varied conditions and resistant to disease, resulted in the appointment of Mr. F. W. L. Sladen, as Assistant Entomologist for Apiculture, who arrived in Canada from England in September.

The bees in our apiary were brought out of the cellar on March 27th to 29th. Thirty colonies were put into winter quarters and twenty-seven were taken out, three having been lost, owing to rats, exhaustion of stores and queenlessness, respectively. The average weight of the colonies on being brought out was 33 pounds, and the average loss in weight during the winter was 14 pounds. The summer was unusually wet and cold; nevertheless, the number of colonies was increased to forty-seven by swarming and dividing, and 882 pounds of honey were taken, an average of

32·66 pounds per hive, spring count. There were 750 pounds of extracted honey, the rest being comb honey. Basswood yielded honey for the first time in several years. Traces of European Foul Brood were found in two colonies in June, and the presence of this disease in the Ottawa district necessitated constant vigilance. A demonstration was given by the Provincial Apiarist, Mr. Morley Pettit, in June, and throughout the summer visits were paid to the apiary by farmers and others seeking practical advice.

As a basis for the future breeding work, arrangements were made for Mr. Sladen to bring with him six pure Italian queens from Bologna, belonging to a strain which had been found to be resistant to European Foul Brood in England. Five of these were successfully introduced at the end of September. Further queens are being imported from Italy, Italian Switzerland and the Southern States.

WINTERING OUT-OF-DOORS.

An experiment in wintering bees out-of-doors in special wintering cases was commenced. Three large winter cases, each capable of holding four hives, with a space of 2 to 5 inches around the sides, 4 inches underneath and 10 inches on top, for packing material, were constructed out of 1-inch pine. Owing to the fact that bees consume more food when wintered out-of-doors than they do when wintered in the cellar, especially heavy colonies were selected for the out door wintering, their average weight being 81·5 pounds. Four of the colonies were packed in shavings, four in cut straw and four in clover chaff. Each hive had its cover removed, the frames being covered with a quilt. The winter cases were raised well above the ground and supported on four wooden hive stands.

The placing of the hives in the winter cases and the packing were completed during the second week in November. The bees had a good flight on November 5, a still and sunny day, with temperature 55° F. A fair number flew on November 21, another still and sunny day, with temperature 50° F. On December 9 the flight holes of the winter cases were reduced on the outside to an L-shaped aperture 1½ inches high, and 4 inches long, each arm being from ⅜ to ½ inches wide. Such an entrance, while protecting the bees as much as possible from cold winds, cannot easily be choked by dead bees. The winter was unusually mild. A few bees were seen flying from some of the hives on 14th and 18th February, some of them dropping and dying in the snow. On 11th and 12th March, the bees were flying rather freely, especially from the entrances facing the sun; they returned well, very few being lost, though the ground was covered with snow. Up to the time of writing, March 31, the colonies have not been examined, but indications point to the probability that the bees have wintered well.

The thirty-five remaining colonies were put into the cellar on November 8. Their average weight was then 51 pounds. On March 15 the bees appeared to be wintering well, and all the colonies were found to be alive except one, which had no food in its combs, its weight having dropped from 47 pounds on November 8, to 28 pounds, a loss of 19 pounds. No queen could be found among the dead bees.

APICULTURE ON THE BRANCH EXPERIMENTAL FARMS.

Apiculture has been continued on certain of the chief farms of this branch, and the following observations are made in the reports received from Nappan, N.S., and Agassiz, B.C., respectively:—

Nappan, N.S.—Fifteen colonies were taken out of the cellar and put on their summer stands on April 2, 1912. Brood rearing had begun. Until July 22 there was promise of a good season, and some fine clover honey was secured;

after that date, however, owing to the excessive wet weather, no honey was gathered. Twenty-five colonies were put into the cellar in December. At date of writing (March 31, 1913) ten colonies have been placed on their summer stands.

Agassiz, B.C.—The ten hives are all in good condition, being quite strong, both in stores and in bees. During the past season an average of 25 pounds of honey per hive was secured. Nine of the hives were wintered out-of-doors, and, with the exception of two, came through in excellent shape. The one hive which has been wintered inside for two years does not seem to have any advantage over those wintered out-of-doors. There has been an abundance of food for the bees; the chief honey plant seems to be the white clover, which is more or less constant from the first of June until the first of September. Fair success was obtained this year in keeping down swarms; this, it is believed, was brought about by always allowing plenty of room and fresh air and by occasionally splitting the brood nest.

During the coming year, it is intended to organize and co-ordinate the apicultural work on the Experimental Farms with a view to ultimately maintaining an apiary on each of the Branch Farms. The extension of bee-keeping in western Canada is especially important, and special attention will be paid to this work and its possibilities. In order to stimulate bee-keeping in Canada, and to guide beginners, a bulletin entitled 'The Honey Bee' was written and published during the year, and has already proved extremely useful.

VIII.—MISCELLANEOUS.

COLLECTIONS.

During the year we have continued to name collections of insects for individuals and teaching institutions. Considerable progress has been made in the arrangement of our now rapidly increasing collection of Canadian insects, to which duty Mr. Germain Beaulieu has assiduously devoted himself, with satisfactory results. The Hemiptera have been arranged, and special attention has been devoted to several orders of the Coleoptera. Mr. Beaulieu has undertaken a careful study of the Elaterid beetles, which includes the various species of wireworms. Mr. Sladen has been placed in charge of the Aculeate Hymenoptera and has made marked progress in arranging this group. Special attention is being paid to the *Bombi*, on account of the economic importance of certain species.

In the determination of new material, Dr. L. O. Howard, Chief of the United States Bureau of Entomology, and his scientific assistants in the Bureau and in the National Museum at Washington, have again placed us under a debt of gratitude by their kind assistance, and our very cordial thanks are extended to other specialists who, in like manner, have so willingly assisted us in our work.

An extensive exhibit of injurious and useful insects and their work was made at the Dominion Exhibition, held at Ottawa, in September.

CORRESPONDENCE.

The increase in the work and in the staff of the Division has naturally resulted in an increase in the correspondence. The number of letters received from April 1, 1912, to March 31, 1913, was 5,105, and the number of letters sent out during the same period was 6,938, compared with 3,993 letters received and 5,465 sent out during the previous fiscal year.

TRAVELLING.

Visits have been made to the various provinces for the purpose of organizing and inspecting the field work, and to give lectures and addresses. In May, I visited Nova Scotia, New Brunswick and Massachusetts in connection with our work against the Brown-tail Moth. At the end of July, I left for England and attended the International Congress of Entomology, which was held at Oxford from August 6 to August 10. On August 12, as Canadian representative, I attended a conference called by the Secretary of State for the Colonies at the Colonial Office to work out a scheme for Imperial co-operation in preventing the spread, and furthering the investigation, of insect pests. This conference and a previous conference held in June, 1911, has resulted in the establishment of the Imperial Bureau of Entomology, to which reference is made in the next section. Lectures and addresses have been given at Halifax, St. John, N.B., Toronto, Winnipeg, and other places. In February, a visit was made to North Portal, Sask., and Winnipeg, Man., in connection with the establishment of a fumigation station in southern Saskatchewan, and the annual meeting of the Manitoba Horticultural and Forestry Association at Winnipeg was addressed. Mr. Arthur Gibson lectured at a short course held at Charlottetown, P.E.I., in January, and has addressed other meetings. As I have already stated, Mr. J. M. Swaine has visited different provinces studying forest insect depredations. Mr. F. W. L. Sladen conducted a short course in apiculture at the Nova Scotia Agricultural College in January, and subsequently addressed meetings and studied apicultural conditions in Nova Scotia and New Brunswick.

IMPERIAL BUREAU OF ENTOMOLOGY.

Through the co-operation of the self-governing British Dominions and colonies and the Colonial Office, an Imperial Bureau of Entomology has been established, at the beginning of the present year, in London, England. It is an expansion of the Entomological Research Committee of the Colonial Office, which was established in 1909, and was concerned with the furthering of entomological research in the British possessions in tropical and sub-tropical Africa, especially in so far as it is related to such human diseases as sleeping sickness and malaria, etc. By securing co-operation and financial support of the self-governing Dominions and Colonies, the Colonial Office has been enabled to broaden the work by the formation of this Bureau which is managed by an honorary committee of experts in Entomology, in tropical and veterinary medicine; the chief entomologist of each of the self-governing Dominions is *ex-officio* a member of the committee.

The functions of the Bureau are as follows:—

1. A general survey of the noxious insects of the world and the collection and co-ordination of information relating thereto, so that any British country may learn by inquiry what insect pests it is likely to import from other countries, and the best methods of preventing their introduction and spread.

2. The authoritative identification of insects of economic importance submitted by the Departments of Agriculture and Public Health throughout the Empire.

3. The publication of a monthly journal, giving concise and useful summaries of all the current literature which has a practical bearing on the investigation and control of noxious insects. This journal, entitled *The Review of Applied Entomology,* commenced in January, 1913. It appears in two parts: Series A, Agricultural, and Series B, Medical and Veterinary. As supporters of, and adherents to, the Bureau, we receive a number of copies of this journal each month and these are distributed to the Provincial Departments of Agri-

culture, the Provincial Entomologists and the libraries of the Universities and Agricultural Colleges. In addition to the *Review*, the Bureau is continuing to publish *The Bulletin of Entomological Research*, containing scientific papers embodying the results of original investigations carried on in the British Colonies.

The problem of the prevention of the spread and also control of insect pests is fundamentally one for international action and co-operative effort. It is, indeed, a most fortunate thing that the British countries have been able in this matter to take advantage of their mutual attachment and interests and to organize in a manner which must ultimately be adopted by all countries of the world, as the prevention of the spread of insect pests with the minimum interference in the interchange of natural products can only be brought about by international co-operation. This is now becoming more generally realized as indicated by the proposal of the International Institute of Agriculture at Rome to form an International Commission to consider the whole subject.

PUBLICATIONS.

The different officers of the Division, both at headquarters and in the field, have contributed scientific papers to entomological and other journals, and more popular articles to the agricultural press. In addition, the following bulletins have been published during the year:—

'The Honey Bee. A guide to Apiculture in Canada,' by C. Gordon Hewitt, 45 pp., 14 figs., (*Bull. 69, of the Experimental Farms Branch*).

'Cutworms and Armyworms,' by Arthur Gibson, 29 pp., 10 figs., 1 pl. (*Bull. No. 70 of the Experimental Farms Branch*).

'The Control of Insect Pests in Canada,' by C. Gordon Hewitt, 13 pp. (*Bull. No. 9, Second Series of the Experimental Farms Branch*).

'The Large Larch Sawfly,' with an account of its parasites and other natural enemies and means of control,' by C. Gordon Hewitt, 42 pp., 21 figs., 4 pls. (*Bull. No. 10, Second Series, of the Experimental Farms Branch*).

'Legislation in Canada to prevent the Introduction and Spread of Insect Pests and Diseases destructive to vegetation, with Regulations regarding importation of vegetation into Canada,' by C. Gordon Hewitt, 36 pp. (*Bull. No. 11, Second Series, of the Experimental Farms Branch*).

STAFF.

The continued increase in our work, and necessary expansion, has necessarily required an increase in the staff of the Division, and the following additions have been made during the past year:—

Mr. F. W. L. Sladen has been appointed Assistant Entomologist for Apiculture. Mr. Sladen was one of the foremost bee-keepers in England and has previously visited Canada and the United States; he has also studied the bees in India. His work on queen-rearing has given him an international reputation and, in addition to his book on *Queen rearing in England*, of which a second edition is now being published, he has published a number of important papers on the pollen collecting habits, etc., of the bees. He has also made extensive studies of the wild bees or *Bombi*, so important in the fertilization of certain of our clovers, and the results of his investigations have been recently published in volume form in his book, *The Humble-bee, its Life History and how to domesticate it, with descriptions of all British species of Bombus and Psithyrus* (Macmillan & Co.). Mr. Sladen's appointment has

given very great satisfaction to Canadian bee-keepers and the great necessity for the extension of apiculture in Canada affords him an unrivaled field for good work.

Mr. H. F. Hudson, B.S.A., has been appointed a field officer of the Division. Mr. Hudson was born in England and graduated at the Ontario Agricultural College, Guelph. Subsequently he joined the staff of Dr. S. A. Forbes, State Entomologist of Illinois, in which position he remained up to the time of his appointment to our service.

Mr. C. E. Petch, B.S.A., was appointed a field officer of the Division in June, 1912. Mr. Petch graduated at the Ontario Agricultural College.

Mr. E. H. Strickland was appointed field officer of the Division in March, 1913. He received his entomological and agricultural training at the Southeastern Agricultural College, Wye, England. In 1910, he was selected by the Colonial Office as a Carnegie Scholar, and spent the years 1910-11 in the United States studying the methods of insect control, under the United States Bureau of Entomology, and carrying on special studies at the Bussy Institution of Harvard University, under Dr. W. M. Wheeler. He will undertake cutworm investigations in Alberta.

The progress and success of the work of the Division has been due to the loyal assistance which all the officers of the Division, both at headquarters and in the field, have rendered. To my chief assistant, Mr. Arthur Gibson, who has had charge of the Division during my absence and has superintended the fumigation and inspection work in addition to the general work of the Division, my especial thanks and acknowledgments are due. Miss J. McInnes and Mr. J. A. Letourneau, with temporary assistance, have conducted the secretarial work to my great satisfaction. It would be impossible to find a staff more devoted to their work than the one I have the privilege to direct, and their zeal is a great inspiration. The territory which we have to cover is only equalled in extent by the infinite variety of problems requiring attention. Gradually, we are taking hold of the more pressing matters for investigation and, as the service is extended, the utility of our work and the assistance we are able to render increases in a greater proportion. I only regret that we cannot directly answer more of the calls for assistance.

I have the honour to be, sir,
Your obedient servant,

C. GORDON HEWITT
Dominion Entomologist.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
EXPERIMENTAL FARMS

REPORT

FROM

THE DIVISION OF ANIMAL HUSBANDRY

ON

BEEF CATTLE, DAIRY CATTLE AND DAIRYING, HORSES, SHEEP AND SWINE

For the Year ending March 31, 1913

PREPARED BY

The Dominion Animal Husbandman, Ottawa, Ont.	E. S. Archibald, B.A., B.S.A.
Supt. Experimental Station, Charlottetown, P.E.I.	J. A. Clark, B.S.A.
Supt. Experimental Farm, Nappan, N.S.	R. Robertson.
Supt. Experimental Station, Kentville, N.S.	W. S. Blair.
Supt. Experimental Station, Cap Rouge, P.Q.	Gus. A. Langelier.
Supt. Experimental Farm, Brandon, Man.	W. C. McKillican, B.S.A.
Supt. Experimental Farm, Indian Head, Sask.	Angus Mackay.
Supt. Experimental Station, Lacombe, Alta.	G. H. Hutton, B.S.A.
Supt. Experimental Station, Lethbridge, Alta.	W. H. Fairfield, M.S.
Supt. Experimental Farm, Agassiz, B.C.	P. H. Moore, B.S.A.

Beef Cattle and Horse Barn, Kentville, Nova Scotia.
Note: (1) Light Provided; (2) Root Cellar under driveway; (3) Ventilation intakes and outlets.

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REPORT

FROM THE

DIVISION OF ANIMAL HUSBANDRY.

J. H. Grisdale, Esq., B.Agr.,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith reports upon the beef cattle, dairy cattle and dairying operations, horses, sheep and swine on the Central Experimental Farm and branch Farms and Stations which have come under my supervision during the past year.

At the commencement of the fiscal year 1912-13, the Animal Husbandry work was made into a division separate from Field Husbandry. Immediately after my appointment in July, 1912, I took up duties at Ottawa. The appointment of an assistant to the Dominion Animal Husbandman was made in August, 1912, when Mr. G. B. Rothwell, B.S.A., was named to the position.

A natural result of the readjustment of work, making of new appointments and much necessary changing and construction, has been a somewhat smaller amount of investigation work with all branches of live stock during the past year.

In the future, however, it is hoped that much more experimental work, both at Ottawa and on the branch Farms and Stations, will be started, and the usefulness of the Division proportionately increased.

In the preparation and compiling of a large amount of the data contained in the text of the Central Farm report, I am indebted to Mr. G. B. Rothwell. The conducting of work and compiling results of such work on the branch Farms and Stations have been in the hands of the Superintendents of those Farms and Stations.

In work with swine, both breeding and feeding, on the Central Experimental Farm, Mr. D. D. Gray, Farm Foreman, deserves special credit for the very efficient manner in which he conducted the various operations and retained careful and accurate results of same.

The work of registration, maintaining, breeding and sales records, and the like, for the Central Experimental Farm has been most efficiently conducted by Mr. G. B. Rothwell.

To Mr. Meilleur, the dairyman at the Central Farm, I am indebted for the excellent work and careful records of his department. Under my supervision he has again found it possible to introduce some new lines of work in the Farm dairy, some details of which will be found in the body of this report.

I regret to report another change of herdsman at the Central Farm. Mr. J. Haining, who has given efficient service during the past three years resigned in January, 1913. However, the position was at once most satisfactorily filled by Mr. Robt. Cunningham. To both must be given credit for interest and assistance

in new work, as well as the satisfactory execution of the routine work in connection with all classes of cattle.

To Miss L. Dean, and also to the Dominion Botanist, Mr. H. T. Güssow, I am indebted for much careful dairy bacteriological research work, which has materially strengthened the dairy experiments. The body of this work will appear as a separate report as soon as sufficient data have been collected.

During the year I have attended several meetings, and judged at various exhibitions, in addition to my regular duties on the Central Experimental Farm. I have also visited, at least once, each of the branch Farms and Stations in the system, where live stock work is being conducted or is anticipated. By this means of consultation and co-operation with the branch Farm Superintendents, it is hoped that the Animal Husbandry work of the Experimental Farm system may be facilitated and consolidated.

I have the honour to be, sir,
Your obedient servant,

E. S. ARCHIBALD.
Dominion Animal Husbandman.

BEEF CATTLE.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN E. S. ARCHIBALD, B.A., B.S.A.

BEEF CATTLE.

No beef breeding work has been conducted on the Central Experimental Farm since the removal, in 1911, of the Shorthorn herd from this Farm to the branch Farm at Brandon, Man. With our present limited land area available for the raising of forage (particularly alfalfa), and the almost complete absence of pasture, it is impossible to carry on such work. Nevertheless, the need of data as to the most economical methods of maintaining breeders and raising stockers and feeders, is appreciated by this Division, and with a Farm extension, would receive prompt attention.

In the meantime, experimental work along the lines of steer feeding has been continued.

BEEF EXPERIMENTAL FEEDING.

The experiment conducted with beef cattle this year was that of a comparison of yearlings of different beef breeds. However, although the majority of the steers in lots I, II, III and IV were just one year of age at the start, yet some of the steers, especially in lot V were several months younger, which added to the inconclusiveness of the test.

The following details of the experiment and deductions from same are instructive as to the profits or losses which may be expected from such methods.

All lots were fed alike as to the kinds and proportions of roughage and grain.

Ensilage or a mixture of ensilage and roots was fed throughout the entire year. Both were valued at $2 per ton.

Mixed clover and timothy hay was fed from January 20, 1912, to June 1, 1912, and from October 5, 1912, to January 5, 1913. This was valued at $7 per ton.

Green feed, consisting of mixed peas and oats, was fed green during June, and as cured hay during July and August, 1912, both valued at $3 per ton.

The meal mixtures for the different periods valued at 1¼ cents per pound as follows:—

From January 13, 1912, to May 11, 1912, a mixture of—

Bran	400 pounds.
Ground oats	200 "
Gluten meal	100 "

From May 11, 1912, to January 5, 1913, a mixture of—

Bran	600 pounds.
Gluten meal	300 "
Banner feed	300 "

All lots were stall-fed throughout the year, as no pasture was available.

Lot I—Shorthorns.

Number of steers in lot		5
First weight, gross, January 13, 1912	lb.	2,955
First weight, average	"	591
Finished weight, gross, January 4, 1913	"	5,880
Finished weight, average	"	1,176
Number of days in test	days.	356
Total gain in 356 days	lb.	2,925
Average gain per steer	"	585
Daily gain per steer	"	1·64
Daily gain per lot	"	8·20
Gross cost of feed for period	$	214 33
Cost of 1 pound gain per lot	cts.	7·32
Cost, original, January 13, 1912, at $6.17 per cwt	$	182 32
Total cost, January 4, 1913	$	396 65
Selling price, January, 1913, less 5 per cent shrinkage, at $7.75 per cwt.	$	432 91
Profit per lot	$	36 26
Profit per steer	$	7 25
Average valuation per steer to start, January 13, 1912	$	36 46
Average sale price per steer at finish, January 4, 1913	$	86 58
Average increase in value	$	50 12
Average cost of feed per steer	$	42 86
Amount of meal eaten	lb.	8,170
Amount of ensilage and roots eaten	"	50,570
Amount of hay eaten	"	14,380
Amount of straw eaten	"	3,031
Amount of green feed eaten	"	3,500

N.B.—These were well-bred grade Shorthorns and were the most uniform lot as to age and weight, which may partially account for their more rapid and more economical gains.

Lot II—Aberdeen Angus.

Number of steers in lot		5
First weight, gross, January 13, 1912	lb.	3,065
First weight, average	"	613
Finished weight, gross, January 4, 1913	"	5,820
Finished weight, average	"	1,164
Number of days in test	days.	356
Total gain in 356 days	lb.	2,755
Average gain per steer	"	551
Daily gain per steer	"	1·55
Daily gain per lot	"	7·75
Gross cost of fed for period	$	215 68
Cost of 1 pound gain per lot	cts.	7·82
Cost, original, January 13, 1912, at $6.17 per cwt	$	189 11
Total cost, January 4, 1913	$	404 79
Selling price, January, 1913, less 5 per cent shrinkage, at $7.75 per cwt.	$	428 49
Profit per lot	$	23 70
Profit per steer	$	4 74
Average valuation per steer to start, January 13, 1912	$	37 82
Average sale price per steer at finish, January 4, 1913	$	85 69
Average increase in value	$	47 87
Average cost of fed per steer	$	43 13
Amount of meal eaten	lb	7,837
Amount of ensilage and roots eaten	"	48,440
Amount of hay eaten	"	17,665
Amount of straw eaten	"	2,891
Amount of green feed eaten	"	1,120

N.B.—Although heavier than the Shorthorns at the start these grade and pure-bred Aberdeen Angus did not make as rapid or as economical gains.

Lot III—Galloways.

Number of steers in lot		5
First weight, gross, January 13, 1912	lb.	2,135
First weight, average	"	427
Finished weight, gross, January 4, 1913	"	4,730
Finished weight, average	"	946
Number of days in test	days.	356
Total gain in 356 days	lb.	2,595
Average gain per steer	"	519
Daily gain per steer	"	1·46
Daily gain per lot	"	7·30

Gross cost of feed for period	lb.	214 42
Cost of 1 pound gain per lot	cts.	8·22
Cost, original, January 13, 1912, at $6.17 per cwt	$	131 72
Total cost, January 4, 1913	$	346 14
Selling price, January, 1913, less 5 per cent shrinkage, at $7.75 per cwt.	$	348 28
Profit per lot	$	2 14
Profit per steer	$	0 43
Average valuation per steer to start, January 13, 1912	$	26 34
Average sale price per steer at finish, January 4, 1913	$	69 65
Average increase in value	$	43 31
Average cost of feed per steer	$	42 88
Amount of meal eaten	lb.	7,752
Amount of ensilage and roots eaten	"	48,240
Amount of hay eaten	"	17,665
Amount of straw eaten	"	2,891
Amount of green feed eaten	"	1,120

N.B.—These Galloways did not have the size, uniformity or breeding of the Shorthorns, Angus or Herefords, and made the lowest net profit of any breed or lot.

Lot IV—Herefords.

Number of steers in lot		5
First weight, gross, January 13, 1912	lb.	2,310
First weight, average	"	462
Finished weight, gross, January 4, 1913	"	5,085
Finished weight, average	"	1,017
Number of days in test	days.	356
Total gain in 356 days	lb.	2,775
Average gain per steer	"	555
Daily gain per steer	"	1·56
Daily gain per lot	"	7·80
Gross cost of feed for period	$	214 42
Cost of 1 pound gain per lot	cts.	7·72
Cost, original, January 13, 1912, at $6.17 per cwt	$	142 52
Total cost, January 4, 1913	$	356 94
Selling price, January, 1913, less 5 per cent shrinkage, at $7.75 per cwt.	$	376 60
Profit per lot	$	19 66
Profit per steer	$	3 93
Average valuation per steer to start, January 13, 1912	$	28 50
Average sale price per steer at finish, January 4, 1913	$	75 32
Average increase in value	$	46 82
Average cost of feed per steer	$	42 88
Amount of meal eaten	lb.	7,752
Amount of ensilage and roots eaten	"	48,240
Amount of hay eaten	"	17,655
Amount of straw eaten	"	2,891
Amount of green feed eaten	"	1,120

N.B.—Although not having the size or the quality of breeding as found in lots I and II, these grade Herefords compared very favourably with those lots as to daily gains and net profits.

Lot V—Mixed Breeds.

Number of steers in lot		6
First weight, gross, January 13, 1912	lb.	2,025
First weight, average	"	337
Finished weight, gross, January 4, 1913	"	5,290
Finished weight, average	"	1,058
Number of days in test	days.	356
Total gain in 356 days	lb.	3,265
Average gain per steer	"	544
Daily gain per steer	"	1·52
Daily gain per lot	"	9·17
Gross cost of feed for period	$	242 17
Cost of 1 pound gain per lot	cts.	7·41
Cost, original, January 13, 1912, at $6.17 per cwt	$	124 94
Total cost, January 4, 1913	$	367 11
Selling price, January, 1913, less 5 per cent shrinkage, at $7.75 per cwt.	$	389 51
Profit per lot	$	22 40
Profit per steer	$	3 73
Average valuation per steer to start, January 13, 1912	$	20 82
Average sale price per steer at finish, January 4, 1913	$	64 92
Average increase in value	$	44 10
Average cost of feed per steer	$	40 35

Amount of meal eaten	lb.	8,812
Amount of ensilage and roots eaten	"	57,518
Amount of hay eaten	"	18,716
Amount of straw eaten	"	3,738
Amount of green feed eaten	"	1,008

N.B.—This lot contained two steers each of the breeding of lots I and II, and one each of lots III and IV. This was intended as a check on lots I, II, III and IV.

Deductions.—Very few deductions of a definite nature can be drawn from this experiment, owing to the small numbers representing each breed, the difficulty in obtaining the best type in grade Herefords and Galloways, and the lack of uniformity in the ages of individuals in the different breeds.

However, there are a few points of value to be noticed, which are as follows:—

1. Stall feeding of young steers during summer months is too expensive. This was shown during the heat of July and again during the first of September, when all steers lost weight.

2. Long feeding of steers, with present high prices for meals, and particularly in the absence of pasture and alfalfa hay, leaves but a small margin of profit, even with a spread between buying and selling prices of over $1.50 per cwt.

3. The best bred steers of most uniform size and quality almost invariably give the greatest profit over the value of food stuff consumed; at the same time command the best market price.

Lot I, Shorthorns, and lot II, Angus, killed particularly well and made choice carcasses, while some individuals in lots III, IV and V made good carcasses, and the remainder only fair.

FINANCIAL STATEMENT.

Below are submitted inventories and returns for the beef cattle on the Central Experimental Farm during the year April 1, 1912, to March 31, 1913:—

	April 1, 1912.		April 1, 1913.		Returns.	Gross returns made up of increase in value of products and value of animals sold.
	No.	Value.	No.	Value.	Value.	
Steers	29	$1,139 76	5	$380 91	$2,129 33	$1,370 48

Returns.

Gross returns, including value of sales, and increased value of reserve	$1,370.48	
Manure, 300 tons at $1 per ton	300.00	
Gross returns		$1,670.48

Expenditures.

To feed consumed	$1,101.00	
To labour	269.00	
Total expenditures		$1,370.00
Net balance from steer feeding		$ 300.48

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT—J. A. CLARK, B.S.A.

Owing to the limited land area available for pasture and the raising of roughages, no breeding beef herd has been established on this Farm.

In consequence, the beef cattle work has been limited to steer feeding.

STEER FEEDING.

A number of steers and heifers were fed to demonstrate possible profits from short-keep steers or heifers of good and of poor flesh. These were purchased and marketed at the ruling market prices.

The meal mixture cost $25 per ton, and was made up as follows:—

Oats (ground)	100	pounds.
Barley (ground)	100	"
Peas (ground)	100	"
Bran	300	"

Roots and ensilage were valued at $2 per ton.

Hay (mixed clover and timothy) was valued at $7 per ton.

The following is a detailed statement of the different lots fed:—

These were steers of the dairy type. They were purchased in poor condition. At the date of the sale these were about three years old.

Beef Production—Lot I.

Number of steers in lot		2
First weight, gross	lb.	1,750
First weight, average	"	875
Finished weight, gross	"	2,335
Finished weight, average	"	1,167½
Total gain in 132 days	"	585
Average gain per steer	"	292·5
Daily gain per steer	"	2·21
Daily gain per lot	"	4·42
Gross cost of feed	$	45 03
Cost of 1 pound gain	cts.	7·7
Value of beef at beginning of experiment	$	70 00
Total cost at end of experiment	$	115 03
Selling price at 5⅝ cents per pound	$	131 34
Profit	$	16 31
Profit per steer	$	8 15½
Average valuation per steer at start	$	35 00
Average selling price per steer at finish	$	65 67
Average increase in value	$	30 67
Average cost of feed per steer	$	22 51
Amount of meal eaten by lot	lb.	1,722
Amount of roots and ensilage	"	18,376
Amount of hay eaten	"	1,476

Lot II.

This was a grade heifer that was sold, after a short period of feeding, to make room for the Hereford steers.

Beef Production—Lot II.

Number of steers in lot		1
First weight	lb.	729
Finished weight	"	809
Total gain in 77 days	"	80
Daily gain per steer	"	1·04
Gross cost of feed	$	5.35
Cost of 1 pound of gain	cts.	6·69
Value of beef at beginning of experiment at 4 cents per pound	$	28 80
Total cost at end of experiment	$	34 15
Selling price, at 4⅜ cents per pound	$	35 24
Profit	$	1 09
Increase in value	$	6 44
Amount of meal eaten by lot	lb.	135
Amount of ensilage and roots eaten	"	2 310
Amount of hay eaten	"	385

Lot III.

The steers in this lot were fairly smooth Shorthorn grades, coming two and three years old. They were in a thrifty condition, though carrying very little fat at the commencement. These steers were dehorned before the test began.

Beef Production—Lot III.

Number of steers in lot		4
First weight, gross	lb.	3,705
First weight, average	"	926
Finished weight, gross	"	4,525
Finished weight, average	"	1,131¼
Total gain in 120 days	"	820
Average gain per steer	"	205
Daily gain per steer	"	1·694
Daily gain per lot	"	6·777
Gross cost of feed	$	80 51
Cost of 1 pound gain	cts.	9·81
Value of beef at beginning of experiment	$	153 39
Total cost at end of experiment	"	233 90
Selling price, at 6 cents per pound	"	271 50
Profit	$	37 60
Profit per steer	$	9 40
Average valuation per steer to start	$	38 34¾
Average selling price per steer at finish	$	67 87½
Average increase in value	$	29 52¾
Average cost of feed per steer	$	20 12¾
Amount of meal eaten by lot	lb.	2 821
Amount of ensilage and roots eaten	"	28,025
Amount of hay eaten	"	3,380

Lot IV.

These steers wer of th dairy typ and not in as thrifty a condition, when bought as lot 3. They were dehorned before the test began.

Beef Production—Lot IV.

Number of steers in lot		4
First weight, gross	lb.	3 652
First weight, average	"	913
Finished weight, gross	"	4,335
Finished weight, average	"	1,084
Total gain in 121 days	"	683
Average gain per steer	"	170¾
Daily gain per steer	"	1·411
Daily gain per lot	"	5·644
Gross cost of feed	$	75 88
Cost of 1 pound of gain	cts.	11·11
Value of beef at beginning of experiment	$	151 19
Total cost at end of experiment	$	227 07
Selling price, at 6 cents per pound	$	260 10

Profit	$	33 03
Profit per steer	$	8 25¾
Average valuation per steer to start	$	37 79¼
Average selling price per steer at finish	$	65 02½
Average increase in value	$	27 23
Average cost of feed per steer	$	18 97
Amount of meal eaten by lot	lb.	2,981
Amount of ensilage and roots eaten	"	25,620
Amount of hay eaten	"	3,716

Lot V.

These grade Shorthorn heifers were in good condition when started and were fed and disposed of as quickly as possible, as they proved to be in calf. These heifers were dehorned before the test began.

Beef Production—Lot V (a).

Number of heifers in lot		1
First weight, gross	lb.	860
Finished weight	"	980
Total gain in 46 days	"	120
Daily gain per heifer	"	2·61
Gross cost of feed	$	5 79
Cost of 1 pound gain	cts.	4·82
Value of beef at beginning of experiment	$	35 00
Total cost at end of experiment	$	40 79
Selling price	$	43 69
Profit	$	2 90
Valuation of heifer at start	$	35 00
Valuation of heifer at finish	$	43 69
Increase in value	$	8 69
Cost of feed	$	5 79
Amount of meal eaten by lot	lb.	233
Amount of roots and ensilage eaten	"	2 070
Amount of hay eaten	"	232

Beef Production—Lot V (b).

Number of heifers in lot		1
First weight, gross	lb.	860
Finished weight	"	1,080
Total gain in 133 days	"	220
Daily gain	"	1·66
Gross cost of feed	$	20 65
Cost of 1 pound gain	cts.	9 41
Value of beef at beginning of experiment	$	35 00
Total cost at end of experiment	$	55 65
Selling price, at 6 cents per pound	$	64 80
Profit	$	9 15
Increase in value	$	29 80
Amount of meal eaten by lot	lb.	884½
Amount of roots and ensilage eaten	"	6,515
Amount of hay eaten	"	871

Lot VI.

Two Hereford steers were purchased at the Maritime Winter Show, when in a finished condition. As the difference between the purchase and the sale price was only ½ cent per pound, the resultant gains very little more than paid for the food consumed. These steers were used for demonstration purposes which no doubt interfered to a certain extent with their feeding.

Beef Production—Lot VI.

Number of steers in lot		2
First weight, gross	lb.	2,485
First weight, average	"	1,242½

Finished weight, gross	lb.	2,795
Finished weight, average	"	1,397½
Total gain in 100 days	"	310
Average gain per steer	"	155
Daily gain per steer	"	1·55
Daily gain per lot	"	3·1
Gross cost of feed	$	38 51
Cost of 1 pound gain	cts.	12 42
Value of beef at beginning of experiment	$	173 95
Total cost at end of experiment	$	212 46
Selling price, at 7½ cents per pound	$	216 75
Profit	$	4 29
Profit per steer	$	2 14
Average valuation per steer to start	$	86 97½
Average selling price at finish	$	108 37½
Average increase in value	$	21 40
Average cost of feed per steer	$	19 25½
Amount of meal eaten by lot	lb.	1,638½
Amount of roots and ensilage eaten	"	12,220
Amount of hay eaten	"	1,660

Deductions.—No deductions of a definite nature can be drawn from a feeding test where the types, condition, sexes, and number of days on test were so lacking in uniformity. Nevertheless, it is interesting to note the following:—

1. There is a good margin of profit in finishing steers when the feeding period is not extended over a too great a time.

2. That the type of steer commonly found throughout this province, although more of dairy than of beef conformation, may be profitably finished by stall feeding on a short keep.

3. Finished steers will continue to make gains, but at a much smaller margin of profit than formerly.

These and other phases of steer feeding will be taken up more extensively during the coming years, and it is hoped that valuable and conclusive data may be obtained.

EXPERIMENTAL STATION, KENTVILLE, N.S.

REPORT OF THE SUPERINTENDENT—W. S. BLAIR.

Although it is not proposed to specialize along Animal Husbandry lines at this Farm, yet in every fruit section farmers need to keep more or less live stock.

It is proposed, therefore, on this particular farm to run a small Shorthorn herd of somewhat mixed dairy and beef lines such as might be advisable for the average fruit-growing farmer of this part of Nova Scotia.

During the past fiscal year accommodation was provided, in the shape of a barn, for the necessary farm horses and a moderate-sized beef herd.

Twenty-two steers were purchased during the fall of 1912, but as these have not been marketed at the time of writing they will be reported on next year.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT—R. ROBERTSON.

It is regrettable to note that on this Farm there is such a shortage of pasture and field area that beef breeding stock cannot be kept. However, there are many problems in steer feeding and finishing applicable to this and other parts of Eastern Canada which demand attention. These are being handled as quickly as time and equipment will allow.

STEER FEEDING.

On making my report on March 31, 1912, forty-five steers under feeding experiment were on hand. The experiment was of a comparative nature, and the results from the different methods followed are instructive. The forty-five steers were divided into three lots of fifteen steers each, and termed lot I, lot II and lot III.

The different lots at the commencement of test were fed as follows:—

Lot I.—Tied. Roots, 40 pounds, and good hay.

Lot II.—Tied. Roots, 80 pounds, and poor hay.

Lot III.—Loose. Roots, 80 pounds, and poor hay.

Roots were decreased and meal increased from time to time during the feeding period.

The meal ration consisted of crushed oats 1 part, crushed barley 1 part, bran 2 parts, cottonseed meal 1 part and oil cake ½ part. This mixture cost 1½ cents per pound.

Roots and ensilage are valued at $2 per ton.

Good hay is valued at $8 and poor hay at $7 per ton.

Below is the report on the different lots for the entire feeding period.

Steer Feeding Experiment, January 1, 1912, to April 30, 1912.

Lot I.

Total live weight of 15 steers, January 1, 1912	lb.	15,210
Total live weight of 15 steers, April 30, 1912	"	18,135
Increase to April 30, 1912	"	2,925
Original weight of 15 steers, 15,210 pounds at 4·75 cents per pound	$	722 47
Weight at finish of 15 steers, 18,135 pounds at 6·50 cents per pound	$	1,178 78
Gross profit	$	456 31
Amount of hay consumed	lb.	28,815
Amount of meal consumed	"	7,710
Amount of roots and ensilage consumed	"	52,050
Cost of feed for lot 120 days	$	287 83
Net profit	$	168 48
Daily rate of gain per steer	lb.	1·625
Cost of 1 pound gain	cts.	9·84
Cost of feed per day per steer	"	15·99
Profit per steer	$	11 23

Lot II.

Total live weight of 15 steers, January 1, 1912	lb.	16,560
Total live weight of 15 steers, April 30, 1912	"	19,485
Increase to April 30, 1912	"	2,925

Original weight of 15 steers, 16,560 pounds, at 4·75 cents per pound....	$	786 60
Weight at finish of 15 steers, 19,485 pounds at 6·50 cents per pound...	$	1,266 63
Gross profit..........	$	479 93
Amount of hay consumed..........	lb.	28,185
Amount of meal consumed..........	"	7,710
Amount of roots and ensilage consumed..........	"	104,100
Cost of feed for lot 120 days..........	$	337 67
Net profit	$	142 26
Daily rate of gain per steer..........	lb.	1·625
Cost of 1 pound gain..........	cts.	11·54
Cost of feed per day per steer..........	"	18·76
Profit per steer..........	$	9 48

Lot III.

Total live weight of 15 steers, January 1, 1912..........	lb.	12,345
Total live weight of 15 steers, April 30, 1912..........	"	17,145
Increase to April 30, 1912..........	"	4 800
Original weight of 15 steers, 12,345 pounds, at 4·75 cents per pound....	$	586 38
Weight at finish of 15 steers, 17,145 pounds at 6·50 cents per pound...	$	1,114 43
Gross profit..........	$	528 05
Amount of hay consumed..........	lb.	28,185
Amount of meal consumed..........	"	7,710
Amount of roots and ensilage consumed..........	"	104,100
Cost of feed for lot 120 days..........	$	318 30
Net profit	$	209 75
Daily rate of gain per steer..........	lb.	2·66
Cost of 1 pound gain..........	cts.	6·63
Cost of feed per day per steer..........	"	17·43
Profit per steer..........	$	13 98

Deductions.—Although no definite conclusions can be drawn from this single experiment, yet the results of this trial point to the following facts:—

1. In comparing lots I and II it is found that half the roots may be dispensed with when good hay is available and yet the same daily gain per steer be maintained.

2. When the finishing period is of short duration, then the high-quality food stuffs and the narrower ration containing a higher per cent of dry matter, give greater profits.

3. In a comparison of lots II and III, the fact is again demonstrated that, on the same foodstuffs, steers will make greater and more economical gains when in loose boxes than when tied in stalls. Nor does this take into account the facts that less labour is expended and more manure of a higher quality is procured when the steers are in loose boxes.

STEER FEEDING EXPERIMENT, 1912-13.

A smaller number of steers than usual were fed this past winter. Thirty-four (34) grade Shorthorn steers were bought in November, dehorned and put up in feeding lots on December 16. The plan of the experiment was the feeding of ten steers (six heavy and medium fat and four of average weight and thin) on 50 per cent more meal and roots than was fed the other twenty-four. Each steer received the same amount of hay, which averaged for ninety days 15 pounds per steer per day. Beginning December 16, lot I was fed 60 pounds roots and 3 pounds meal per steer per day. On account of making ready for an Easter market, the meal ration was increased rather more rapidly than usual, so that by February 28 it reached 12 pounds per steer per day. The root ration meanwhile was gradually dropped to 30 pounds per steer per day. Lot II, during this time, received 50 per cent less meal and roots than lot I.

A very satisfactory sale having been made for Easter delivery, this experiment was concluded on March 15.

Meal mixture consisted of bran, crushed oats and oil cake meal in proportions of 2: 2: 1, and valued at 1¾ cents per pound. Roots were valued at $2 per ton and hay at $8 per ton.

Lot No. I.—December 15, 1912, to March 15, 1913.

Total live weight of 10 steers, December 15, 1912	lb.	12,140
Total live weight of 10 steers, March 15, 1913	"	14,370
Increase to March 15, 1913	"	2,230
Original weight of 10 steers, 12,140 pounds, at 4⅗ cents per pound	$	558 44
Weight at finish of 10 steers, 14,370 pounds, at 6¾ cents per pound	$	969 97
Gross profit	$	411 53
Amount of hay consumed	lb.	13,500
Amount of meal consumed	"	7,650
Amount of roots consumed	"	34,350
Cost of feed for lot, 90 days	$	215 40
Net profit	$	196 13
Daily rate of gain per day per steer	lb.	2·47
Cost of 1 pound of gain	cts.	9·65
Cost of feed per day per steer	"	23·93
Profit per steer	$	19 61

Lot No. II.

Total live weight of 10 steers, December 15, 1912	lb.	25,495
Total live weight of 10 steers, March 15, 1913	"	29,520
Increase to March 15, 1913	"	4,025
Original weight of 24 steers, 25,495 pounds at 4·60 cents per pound	$	1,172 77
Weight at finish of 24 steers, 29,520 pounds at 6·75 cents per pound	$	1,992 60
Gross profit	$	819 83
Cost of feed for lot, 90 days	$	382 56
Amount of hay consumed	lb.	32,400
Amount of meal consumed	"	12,240
Amount of roots consumed	"	54,,960
Net profit	$	437 27
Daily rate of gain per day per steer	lb.	1·88
Cost of 1 pound of gain	cts.	9·54
Cost of feed per day per steer	"	17·71
Profit per steer	$	18 22

Deductions.—Here again no definite deductions should be drawn, yet the following facts are of interest and should be noted:—

1. Greater profits per steer in finishing are obtained by the use of a heavier meal ration. In other words, the short-keep steer is more profitable than the long-keep steer.

2. Roots are of great value in finishing, but should be used in greater proportion at the commencement of the finishing period than at the end, when the quantity of meal is greatest.

3. The most rapid gains in steer finishing accompany the heavier feeding, and are most economical. This is but natural as in either case the food required to supply internal heat and energy is proportionately the same; while the surplus nutrition is stored as bodily gain.

These and other phases of steer-feeding work will be continued during coming winters.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT—W. C. McKILLICAN, B.S.A.

STEER FEEDING EXPERIMENTS.

The feeding of steers out-of-doors as compared with stabling was again tested in the winter of 1911-12. A carload of steers was bought on November 30, 1911, at $4\frac{1}{4}$ cents per pound. They were not as good steers as have usually been used in the experimental work. They were divided into two lots. One lot of twelve was fed out-doors, with no shelter except native scrub oak trees. They were fed on straw, as the principal roughage, and with a small quantity of dry corn stalks and a little alfalfa, at the last of the feeding period. They also received a small quantity of frozen turnips, during the middle of the test. Their grain ration started at 2 pounds per day, and was gradually increased to 15 pounds per day.

The steers fed inside received a daily ration of 8 pounds of straw, 15 pounds of turnips and 35 pounds of corn silage. They also received a little alfalfa, at the end of their feeding period. Their grain ration started at 2 pounds per day, and was gradually increased to 13 pounds per day.

The feed consumed was valued at the following rates:—

Straw	$ 2 00	per ton.
Oats and barley	20 00	"
Dry cornstalks	5 00	"
Corn silage	2 00	"
Roots	2 00	"
Alfalfa	12 00	"

Results.		Lot 1 Outside.	Lot 2 Inside.
Number of steers in lot		12	7
First weight, gross, November 30, 1911	lb.	11,495	6,835
" " average	"	958	976
Finished weight gross, May 13, 1912	"	14,310	8,050
" " average	"	$1,192\frac{1}{2}$	1,150
Total gain in 167 days	"	2,815	1,215
Average gain per steer	"	$234\frac{1}{2}$	174
Daily gain per steer	"	1·4	1·04
First cost of steers at $4\frac{1}{4}$ cents per pound	$	488 54	290 49
Total cost of feed	"	281 49	164 92
Total cost	"	770 03	455 41
Receipts from sale at $6\frac{3}{4}$ cents per pound, 5 per cent shrinkage	"	987 63	516 20
Profit	"	217 60	60 79
Average cost per steer	"	40 71	41 50
Average cost feed per steer	"	23 46	23 56
Average selling price per steer	"	82 30	73 74
Average profit per steer	"	18 13	8 68
Average cost 100 pounds gain	"	10 00	13 57
Amounts of Feed used.			
Oat and barley chop	lb.	19,792	9,762
Straw	"	32,000	9,296
Dry corn stalks	"	11,000	
Corn silage	"	....	33,000
Roots	"	5,460	15,760
Alfalfa	"	3,264	1,542

Summary of five years' Experiments in Outside versus Inside Feeding.

As this experiment has now been continued for five years, it would seem to be an opportune time to summarize the results and obtain the average for these years.

Year.	Profit per Steer.		Average gain per Day.	
	Outside.	Inside.	Outside.	Inside.
	$ cts.	$ cts.	Lb.	Lb.
1908	7 05	5 52	1·6	1·81
1909	0 47	5 79	·77	1·2
1910	(loss) 1 84	13 77	1	1·56
1911	21 90	23 86	1·29	1·34
1912	18 13	8 68	1·4	1·04
Average for 5 years	9 14	11 52	1·21	1·39

Prices realized for Grain Fed.

The business of feeding cattle will appeal to more people as a possible means of realizing larger prices for their grain, than as a separate business undertaking. If grain had to be bought for feeding, most farmers would need to be assured of large and certain profits; but if it can be shown that the oats and barley on hand can be marketed at much better prices than otherwise obtainable, it is then a proposition that appeals to all, and especially to the man who is some miles from the elevator.

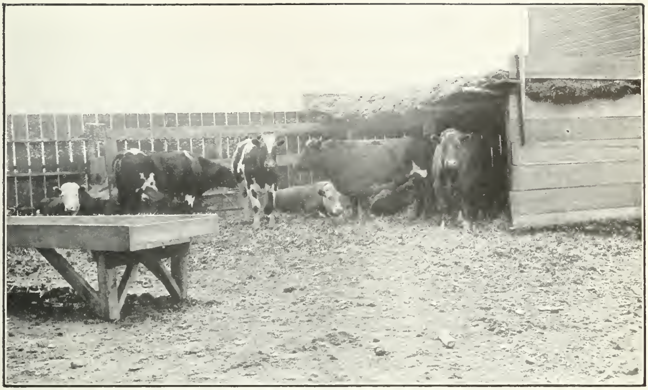
The following figures have been obtained by deducting the cost of roughage and purchased feeds and the first cost of the steers from the receipts of the sale and, from that, ascertaining what has been obtained from the grain used.

Prices obtained for Oats.

Year.	Fed to Outside Steers.	Fed to Inside Steers.
1908	47 cents per bushel	43 cents per bushel
1909	35½ " "	53½ " "
1910	31 " "	84 " "
1911	95 " "	118½ " "
1912	71½ " "	55 " "
Average for 5 years	56	71

Prices obtained for Barley.

Year.	Fed to Outside Steers.	Fed to Inside Steers.
1908	66 cents per bushel	60½ cents per bushel
1909	50 " "	76 " "
1910	43½ " "	117 " "
1911	134½ " "	168 " "
1912	101 " "	78 " "
Avearge for 5 years	79	100



Steer Feeding. Experimental Station, Lethbridge, Alta.
Showing: (1) Shelter for winter feeding; (2) Grain feeding table.

Steer Feeding. Experimental Station, Lethbridge, Alta. Showing type of Steers fed.

In all the figures, labour has not been considered. Each reader must therefore estimate how much the labour would lessen the profits in his own particular case. Against labour, there must be balanced the value of the manure and the smaller cost of marketing cattle, as compared with grain. This will vary under different circumstances and in different locations. It is the opinion of the writer that on very many farms these figures need not be reduced at all. But, even after making a liberal allowance for the cost of labour, the prices realized for grain during these five years are very much greater, through feeding it to the steers, than could be obtained in the ordinary way.

The following conclusions would seem to be justified by the five years' experiments:—

1. Steers may be fattened successfully and profitably outside, in the climate of Manitoba.

Greater gains at the cost of less feed, can be made where the steers can be stabled.

3. The increased gains from stabling are probably not sufficient to justify the expenditure necessary for building expensive stables.

4. The oats and barley grown on western farms could be marketed more profitably by feeding to steers than by selling at the prices usually obtainable.

STEER-FEEDING EXPERIMENT FOR 1912-13.

Twenty steers were bought in November, 1912, for a feeding experiment. This year they are all being fed out-of-doors. One lot receives nothing but straw and grain. The other lot receives less grain, but gets chopped alfalfa in its place. The experiment is not finished at the end of the fiscal year, and will have to wait for next year's report.

BULLETIN.

A bulletin has been written on 'Experiments in Steer Feeding at Brandon Experimental Farm'; this bulletin gives a report on the experimental work in steer feeding done on this Farm during the past twenty years, and summarizes and comments on the results.

It will be available to any person who applies for a copy.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT—ANGUS MACKAY.

Due to the loss of the barns during the early part of the last fiscal year, no new work with beef cattle was started.

The herd of Shorthorn breeding cattle is about as reported last year and numbers as follows: one bull 4 years old, 28 cows and heifers, 10 yearling heifers and calves, and 3 young bulls.

Upon the completion of the new barns, the best milkers of this herd will be treated as a Shorthorn dairy herd, numbers will be increased and experimental feeding work with breeders and steers will be dealt with along larger lines than formerly.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT—G. H. HUTTON, B.S.A.

BREEDING CATTLE.

A herd of Aberdeen Angus was established during the year, containing blood of many famous strains, as represented by good individuals. The herd numbers twenty head and is headed by 'Elm Park Ringleader 7th –2861, 117826.' This is an excellent foundation herd with which to conduct breeding work.

FEEDING FOR BEEF.

Three groups of steers have been on feed during the winter of 1912-13. Each group was made up equally, as far as possible, with reference to breed, age, weight and quality. The advantage in the matter of weight was given to the group intended for inside feeding. The cattle were two and three years old, and there were twelve in each of the three groups. A fourth group of thirteen head was also fed, but were handled in exactly the same manner as group No. 3. They were the poorest and smallest group to begin with and, since they represented the culls of the entire purchase, the results need not be considered except in so far as they have a bearing upon the gain made by average stock available for feeding. These were not up to the average and did not reach a standard of sufficient merit to bring the price secured for the better class of cattle. These cull cattle were sold at six cents per pound, straight weight, to the Swift Canadian Co., Ltd., who were also the buyers of the groups used in the experimental feeding, at seven and one-half cents, subject to a five per cent shrinkage. Delivery was made on March 15. The eight small steers from the bunch of culls made a loss of forty-four cents per head, but the average profit for the forty-nine head, after paying for all feed at market prices shown in the tables, was $10.56 per head. These figures show the advantage of feeding larger cattle and of better breeding to secure larger cattle at the same age. A number of young cattle were fed this year that made good profits, but they were of good type to begin with and of good size for their age. One steer was sold, which was less than two years old, that weighed 1,105 pounds, and brought $78.75, being considered good enough for coast trade. He was a good killer and showed the probability of a very small percentage of waste.

The three groups were fed on exactly the same feeds, but were given different accommodation. Group No. 1 was fed in the barn in box stalls, which were kept well bedded and cleaned at regular intervals. They were not let out at all except once each month, for the purpose of being weighed. They had water twice a day, though it was practically before them throughout the day. They were fed straw in their mangers, as well as green feed and hay during the last three weeks of the feeding period, as were also the other two groups.

Group No. 2 was fed in the corral, having but a very limited run, being confined near the buildings. These steers had water before them at all times and were fed their roughage in the feeding racks about the corral. They got their straw at the straw-stack. The water in the tank was kept free from ice by the use of a tank heater.

Group No. 3 was fed in the bluff toward the western boundary of the farm, were at liberty to run free practically over a half section of land and had access to the straw stacks, and were fed green feed on the ground. They watered at a small lake, through the ice.

The grain mixture used this year consisted of wheat, oats and barley, mixed in the proportion of one-fifth wheat, two-fifths oats and two-fifths barley, finely ground. The chop was charged at one cent per pound, the green feed at $10 per ton, hay at $10 per ton, salt at cost, and the straw consumed per head has been estimated at one ton per steer and charged at $2 per ton.

The labour cost has not been charged against the steers in the table nor are they credited with the manure produced. It has been found from a number of experiments conducted at this Station, that manure is well worth $1 per ton applied. It can be applied for 25 cents per ton. It would appear fair, therefore, to credit the steers with the manure produced at 75 cents per ton, in the yard. The manure produced by the cattle fed inside, weighed 140,400 pounds. In comparing the value of manure from the three groups, it would be well to remember, however, that the manure from group No. 1 can be more cheaply collected than that from those fed outside, where it has been deposited over a wider area; mostly about the stacks, it is true, but still a part of it will be lost. Group No. 1 required 261 hours 30 minutes labour to attend to them for 109 days; group No. 2 required 64 hours 15 minutes, while on group No. 3, 50 hours of labour were expended. Those who are not in a position to realize on the fertilizer value of farm-yard manure, should charge the labour against the cattle at current wages.

The following tables give further details in regard to this experiment:—

———		No. 1.	No. 2.	No. 3.
No. of Steers in lot		12	12	12
First weight November 25, 1912	Lb.	13,225	12,765	12,550
" " average	"	1,102	1,063¾	1,046
Finished weight, 12 steers	"	15,232	15,118	14,304
" " average	"	1,269	1,260	1,192
Total gain in 109 days	"	2,007	2,353	1,754
Average gain per steer	"	167	196	146
Average daily gain per steer	"	1·53	1·79	1·34
" " " " lot	"	18 36	21·48	16·08
Gross cost of feed	$	219 53	224 35	224 70
Cost of 100 pounds gain	"	10 94	9 53	12 81
Selling price, 10 steers, 7½ cents per pound live weight, less 5 per cent	"	923 85	1,077 15	1,019 17
Selling price, 2 steers, 6 cents per pound	"	135 96	....	
Profit on 12 steers	"	131 42	168 60	121 79
Profit per steer	"	10 95	14 05	10 15
Average value of steer at start	"	59 07	57 01	56 06
" selling price per steer	"	88 32	89 76	84 93
" increase in value	"	29 25	32 75	28 87
" cost of feed per steer	"	18 30	18 70	18 72
Amount of meal eaten	Lb.	12,234	12.383	13,382
" hay eaten	"	1,730	1,763	1,291
" green feed eaten	"	11,205	11,677	10,635
" straw eaten	"	24,000	24,000	24,000
" salt eaten	"	110	25	20

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT—W. H. FAIRFIELD, M.S.

STEER FEEDING.

Owing to the fact that the acreage of alfalfa is increasing so rapidly on the irrigated lands in the Lethbridge district, the question of disposing of the surplus by feeding on the farm rather than by baling and shipping out is becoming more important each season. The following experiment was carried out to ascertain just what can be obtained for good alfalfa hay when fed to steers.

Twelve 2-year-old steers were purchased from Mr. A. E. Ives, of Lethbridge. These were out of a bunch that he had shipped in from Manitoba during the summer. The price paid was 6¼ cents per pound. They were dehorned the same day that they were received. The feeding was done in the open; the only shelter provided the cattle was a straw shed, open on the east side. The following values were put on the feeding stuffs used:—

Alfalfa, per ton	$12
Rutabagas, per ton	3
Damaged oat hay, per ton	5
Grain, per ton	20

The mixture of grain fed was: wheat 4 parts, barley 3 parts, and oats 3 parts. The steers were sold locally to Mr. R. Coultry, a Lethbridge butcher.

Number of animals in group		12
First weight, gross, December 26, 1912	lb.	11,000
" average	"	916·7
Finished weight, gross, May 24, 1913	"	14,160
" " average	"	1,180
Number of days in experiment		149
Total gain for period	lb.	3,159·6
Average gain per animal	"	263·3
" daily gain for group	"	21·2
" " per animal	"	1·77
Quantity meal eaten by group for period	"	14,917
" roughage alfalfa hay "	"	18,006
" oat hay for period	"	1,390
Rutabagas for period	"	39,974
Total cost of feed	$	320·85
Cost of feed per head	"	26 73
" " per day	"	0 18
Cost to produce 1 pound gain	"	0 10
Original cost of animals at 6¼ per lb.	"	687 50
" " plus cost of feed	"	1,008·50
Selling price, at $8 per 100 pounds	"	1,132·80
Net profit per group	"	124·45
" per animal	"	10 37

Findings from experiment.

Nutritive ratio of total ration		1:7·07
" " meal "		1·7·63
Dry matter required to produce 1 pound gain	"	10 36
Digestible matter " 1 "	"	8·25
Meal mixture, wheat 4 parts, to produce 1 pound gain	"	4·72
Barley 3 parts, oats 3 parts " 1 "	"	
Roughage, alfalfa to produce 1 pound gain	"	5·69

Conclusions.—As the primal object of the experiment was to ascertain what could be realized by feeding prime alfalfa hay to steers, the following is given:—

Value of grain fed, at $20 per ton..	$149 17
Value of damaged oat hay, at $5 per ton..	3 47
Value of turnips, at $3 per ton..	59 96
Value of salt..	1 50
	$214 10

DAIRY CATTLE

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN—E. S. ARCHIBALD, B.A., B.S.A.

DAIRY CATTLE.

There are in all 138 head of cattle in the stables, comprised of 113 pure-bred breeding cattle, 24 grade milch cows and one grade heifer. The pure-breds are kept for experimental breeding and feeding work.

Pure-Bred Breeding Cattle.

Ayrshires, 38, including 19 milch cows, 15 heifers and 4 males.
Canadians, 27, including 14 milch cows, 8 heifers and 5 males.
Guernseys, 22, including 9 milch cows, 9 heifers and 4 males.
Holsteins, 18, including 7 milch cows, 7 heifers and 4 males.
Jerseys, 8, including 4 milch cows, 2 heifers and 2 males.

Grade Milch Cows.

Grade Ayrshire cows, 12.
Grade Holstein cows, 12.

These cows are kept for several reasons, namely: (1) to supply milk for dairy experimental manufacture, (2) to test the high quality grade cow for economy of production, (3) to test the grade against the pure-bred cow, and (4) to obtain the female offspring from these cows and sired by the best obtainable pure-bred bulls of the breeds, (5) to show the advantage of continued and persistent upgrading of the grade herds. This latter experiment is well under way on several branch Farms. Data of such import cannot be acquired too rapidly.

The herds of dairy cattle, during the year 1912-13, included 77 milch cows, as follows:—

The Holstein herd, established in the years 1911 and 1912, is here reported upon for the first time. Although seven cows were milking during the year, only five are reported as having finished a lactation period previous to April 1, 1913.

The Ayrshire herd, established in 1901, remains with almost no changes since last reported, and contains 19 milch cows.

The Guernsey herd, also established in 1901, has made only the natural growth, and contains 9 milch cows.

The French Canadian herd remains practically unchanged, and contains 14 milch cows.

The Jersey herd, established in the years 1911 and 1912, is not reported on for production, as no cows have finished a full lactation period. Only 4 cows and heifers were milking during the year.

The grade Ayrshire and grade Holstein herds, including in each 12 milch cows, were established during the past year. None, as yet, has completed a full lactation period; hence are not reported.

FEEDING THE DAIRY COWS.

The year 1912-13 has been satisfactory for pasture. Grass started fairly early in the spring, but suffered considerably from drought during July and early August. The heavy rains of September, however, made exceedingly good pasture.

SUMMER FEEDING.

As in previous years, the dairy cattle were allowed only a small area for pasture and were compelled to depend largely upon soiling crops and corn silage. As pasture, there was available only a little over 19 acres. This afforded forage for nearly a month, and was so charged.

In July and parts of August and September, soiling crops, consisting of clover, mixed peas and oats and green corn, were fed either in the stables or in pasture.

Corn ensilage for feeding in August had been provided in 1911.

Meal was fed during the entire summer, as needed by cows in milk, and dry cows and pregnant heifers in low condition.

As formerly, during the early part of summer, the cows were in the field during the daytime and stabled at night, but during the heat of midsummer, and as flies became more troublesome, they were housed during the day and kept in pasture at night.

WINTER FEEDING.

The winter feeding was carried on under quite as favourable conditions as the summer. Feed was plentiful and of good quality. Cattle entered the barns in good flesh and did well.

The winter ration was on the average about as follows:—

Hay	5	pounds.
Corn ensilage	30	"
Roots	10	"
Straw	4	"
Meal	7	"

The meal mixture consisted of a mixture of 600 pounds bran; 300 pounds gluten; 200 pounds dried brewers' grains; and 200 pounds cottonseed meal.

The hay was mixed red clover and timothy. The corn silage was of good quality, rich in grain and well preserved.

The roots were mangels, sugar mangels, sugar beets and turnips. They were usually pulped and mixed with the ensilage.

The straw was, of course, oat, and owing to rains during harvest was of poor feeding quality. It was cut and mixed with the pulped roots and ensilage.

The meal was scattered on the roughage mixture of roots, ensilage and cut straw, after it was before the cattle. The hay given was fed uncut, after the other material had been cleaned up.

Generally speaking, the milch cow is allowed all the roughage she will consume. Meal is given in proportion to milk produced. If a cow responds freely and profitably to an increase of meal, she is fed more liberally up to the point where profit ceases. Many cows, recently fresh, will profitably consume one pound of meal to every three pounds of milk produced. However, at average prices paid the farmer for dairy produce, this would leave but little profit. A fair standard, and one which is giving us good results is: 1 pound meal fed for every 4 pounds milk produced.

Aside from the milk produced, there are three great factors which must influence the amounts of meal fed, namely, its richness, palatability, and variety. The

Steers feeding out-doors in Winter, Brandon Experimental Farm.

Interior View, dairy Barn, Experimental Station, Lacombe, Alberta. Note: Light, hanging of windows and the comfort and cleanliness of cattle and barn.

above mixture illustrates a rich meal, having a sufficient diversity in its elements to give variety and palatability, thus maintaining the appetite of the animal.

Water is before the cows all the time. Salt is added to the roughage at the time of mixing.

DAIRY CATTLE EXPERIMENTS.

This work, including the conducting of the tests of foodstuffs for dairy cattle, the test of the milking machine and the compiling of results from the same, has been done by Mr. Rothwell, Assistant to the Animal Husbandman.

Testing Molasses as a Feed for Dairy Cows.

Beginning February 23, 1913, an experiment was conducted with the grade herd to ascertain the value of molasses as a substitute for meal in the regular meal mixture. During the test, each cow received the same number of pounds of meal or meal and molasses, in order to show the value of molasses in replacing meal, by a comparison of the average of Periods 1 and 3 with Period 2. Each period consisted of two weeks, the first week as a transitory stage, the second week as a basis of calculation. Throughout the tests, the cows were weighed each Monday at 11 a.m.

The following table is calculated on the feed and production of ten cows in the herd:—

SUMMARY SHEET.—DAIRY COW FEEDING EXPERIMENT No. 1A.

Object of Experiment.—To test value of molasses as a substitute in the meal ration.
Rations.—Period 2: Grain, no molasses.
Periods 1 and 3: Grain, plus 20 per cent molasses.
Value of feeds per ton.—Hay, \$7; straw, \$4; turnips and silage, \$2; molasses, \$23; meal, 1¼ cents per pound.
Grain, mixture of.—Bran, 600 pounds; gluten meal, 300 pounds; oil cake, 200 pounds; cotton-seed meal, 200 pounds; and dried brewers' grains, 200 pounds.

—	Period 1.	Period 3.	Period 1 and 3 average.	Period 2.
Number of cows in test	10	10	10	10
Pounds of milk produced by 10 cows.... lb.	2,111·5	1,927	2,019·5	2,144·5
Average milk per cow per day.... "	30·2	27·5	28·8	30·6
Average per cent fat in milk.... "	3·4	3·4	3·4	3·4
Total pounds fat produced by 10 cows.... "	71.79	65·51	68·64	72·69
Average pounds fat per cow per day.... "	10·2	9·4	9·8	10·4
Total meal consumed.... "	571·2	571·2	571·2	714
Total molasses consumed.... "	142·8	142·8	142·8	....
Mixture consumed per 100 pounds fat produced.. "	994	1,089	1,040	978
Mixture consumed per 100 pounds milk produced. "	33·8	37·1	35·4	33·3
Findings from Experiment.				
Cost of meal mixture fed.... \$	8·78	8·78	8·78	8·92
Value of roughage fed.... "	7·35	7·35	7·35	7·35
Total cost of feed.... "	16·13	16·13	16·13	16·17
Cost to produce 100 pounds fat.... "	22·47	24·60	23·49	22·32
" " 1 pound fat.... cts.	22·5	24·60	23·5	22·1
" " 1 pound butter.... "	19·1	20·0	19·9	18·9
Profit on 1 pound butter at 30 cents per pound.... "	10·9	9·1	10·1	11·1
Cost to produce 100 pounds milk.... "	76·4	83·7	79	75·9
Profit on 100 pounds milk at \$1.70 per cwt.... "	93·6	86·3	91	94·1

As a check on this experiment, a similar test was conducted with the cattle in the main barn. The results as obtained from ten cows of this herd, are herewith given:

SUMMARY SHEET.—DAIRY COW FEEDING EXPERIMENT No. 1B.

Object of Experiment.—To test value of molasses as a substitute in the meal ration.
Rations.—Period 2: Grain, no molasses.
Periods 1 and 3: Grain, plus 20 per cent molasses.
Value of feeds per ton.—Hay, $7; straw, $4; turnips and silage, $2; molasses, $23; meal, 1¼ cents per pound.
Grain, mixture of.—Bran, 600 pounds; gluten meal, 300 pounds; oil cake, 200 pounds; cotton-seed meal, 200 pounds; and dried brewers' grains, 200 pounds.

—	Period 1.	Period 3.	Periods 1 and 3, average.	Period 2.
Number of cows in test	10	10	10	10
Pounds of milk produced by 10 cows lb.	1,595	1,433	1,519	1,571
Average milk per cow per day "	22·8	20·4	21·7	22·7
Average per cent. fat in milk "	4·2	4·2	4·2	4·2
Total pounds fat produced by 10 cows "	67·99	59·18	63·79	66·40
Average pounds fat per cow per day "	·97	·84	91	·95
Total meal consumed "	498·4	498·4	498·4	623
Total molasses consumed "	124·6	124·6	124·6	......
Mixture consumed per 100 pounds fat produced "	916	1,054	978	938
Mixture consumed per 100 pounds milk produced "	39	43·4	40·3	39
Findings from Experiment.				
Cost of meal mixture fed $	7·65	7·65	7·65	7·79
Value of roughage fed "	5·81	5·81	5·81	5·81
Total cost of feed "	13·46	13·46	13·46	13·60
Cost to produce 100 pounds fat "	19·65	22·76	21·10	20·48
" " 1 pound fat cts.	19·6	22·7	21·1	20·4
" " 1 pound butter "	17	19	18	17·5
Profit on 1 pound butter at 30 cents per pound "	13	11	12	12·5
Cost to produce 100 pounds milk "	84	93·5	88	86
Profit on 100 pounds milk at $1.70 per cwt "	86	76·5	82	84

While the results, as shown, are not as conclusive as might be desired, certain facts are indicated. It may be mentioned that these experiments are but forerunners of a series of tests with the feeding of molasses, and that, until further data have been collected, these results cannot be regarded as conclusive. However, it would appear that while molasses may be substituted as part of a meal ration and slightly reduce its cost, its addition in any considerable quantity is not economical. While molasses is of no inconsiderable value as a food, its chief desirability is in its appetizing and tonic qualities, the benefits of which may be derived by its being incorporated with the meal in much lesser quantities than those tried. An addition of, say, 10 per cent of the meal fed allows of this, yet does not materially reduce the feeding value of the concentrates.

In order to ascertain whether or not increasing the molasses constituent might prove economical, the test was continued as Experiment 2A.

SUMMARY SHEET.—DAIRY COW FEEDING EXPERIMENT No. 2A.

Object of Experiment.—To test value of molasses as a substitute in the meal ration.
Rations.—Period 2: Grain, plus 30 per cent molasses.
Periods 1 and 3: Grain, plus 20 per cent molasses.
Value of feeds per ton.—Hay, $7; straw, $4; turnips and silage, $2; molasses, $23; meal, 1¼ cents per pound.
Grain, mixture of.—Bran, 600 pounds; gluten meal, 300 pounds; oil cake, 200 pounds; cotton-seed meal, 200 pounds; and dried brewers' grains, 200 pounds.

—		Period 1.	Period 3.	Periods 1 and 3, average.	Period 2.
Number of cows in test		10	10	10	10
Pounds of milk produced by 10 cows	lb.	1,927	1,650·5	1,783	1,642·5
Average of milk per cow per day	"	27·5	23·5	25·45	23·4
Average per cent fat in milk	"	3·4	3·4	3·4	3·4
Total pounds fat produced by 10 cows	"	65·5	65·1	60·7	55·8
Average pounds fat per cow per day	"	·935	·7990	·867	·798
Total meal consumed	"	571·2	571·2	571·2	499·8
Total molasses consumed	"	142·8	142·8	142·8	214·2
Mixture consumed per 100 pounds fat produced.	"	1,090	1,270	1,180	1,280
Mixture consumed per 100 pounds milk produced	"	37·	43·2	40	43·5
Findings from Experiment.					
Cost of meal mixture fed	$	8·78	8·78	8·78	8·70
Value of roughage fed	"	7·35	7·35	7·35	7·35
Total cost of feed	"	16·13	16·13	16·13	16·05
Cost to produce 100 pounds fat	"	24·47	28·75	26·61	28·90
" " 1 pound fat	cts.	24	28	26	28·1
" " 1 pound butter	"	21	25	22·5	25·1
Profit on 1 pound butter at 30 cents per pound	"	9	5	7·5	4·9
Cost to produce 100 pounds milk	"	83·7	97	90	97·7
Profit on 100 pounds milk at $1.70 per cwt.	"	86·5	73	80	72·3

Here the additional 10 per cent proved a detriment, as shown by a decrease in production and incidentally a decrease in weight as shown in the table of weights. This was, in all likelihood, due to the noticeably relaxed condition of the cows caused by the laxative nature of the molasses substitute, and to the fact that they were, at the same time, receiving a liberal allowance of succulent food in the form of roots.

As in the case of Experiment 1A, a duplicate test of Experiment 2A was made with the cattle in the main barn, data being compiled from the production of the same ten cows as in Experiment 1B.

SUMMARY SHEET.—DAIRY COW FEEDING EXPERIMENT No. 2B.

Object of Experiment.—To test value of molasses as a substitute in the meal ration.
Rations.—Period 2: Grain, plus 30 per cent molasses.
Periods 1 and 3: Grain, plus 20 per cent molasses.
Value of feeds per ton.—Hay, \$7; straw, \$4; turnips and silage, \$2; molasses, \$23; meal, 1¼ cents per pound.
Grain, mixture of.—Bran, 600 pounds; gluten meal, 300 pounds; oil cake, 200 pounds; cottonseed meal, 200 pounds; and dried brewers' grains, 200 pounds.

—		Period 1.	Period 3.	Periods 1 and 3, average.	Period 2.
Number of cows in test		10	10	10	10
Pounds of milk produced by 10 cows	lb.	1,433	1,335	1,384	1,366·5
Average milk per cow per day	"	20·4	19	19·8	19·5
Average per cent fat in milk	"	4·2	4·1	4·1	4·1
Total pounds fat produced by 10 cows	"	59·18	54·33	56·74	56·02
Average pounds fat per cow per day	"	·84	·78	·81	·80
Total meal consumed	"	498·4	498·4	498·4	436·1
Total molasses consumed	"	124·6	124·6	124·6	186·9
Mixture consumed per 100 pounds fat produced	"	1,054	1,147	1,098	1,113
" " milk "	"	43·4	46	45	45·6
Findings from Experiment.					
Cost of meal mixture fed	\$	7·65	7·65	7·65	7·59
Value of roughage fed	"	5·81	5·81	5·81	5·81
Total cost of feed	"	13·46	13·46	13·46	13·40
Cost to produce 100 pounds fat	"	22·76	24·79	23·70	23·92
" 1 pound fat	Cts.	22·7	24·7	23·7	23·9
" 1 pound butter	"	19	21	20·3	20·7
Profit on 1 pound butter at 30 cents per pound	"	11	9	9·7	9·3
Cost to produce 100 pounds milk	"	94	100	97	98
Profit on 100 pounds milk at \$1.70 per cwt	"	76	70	73	72

DAIRY COW FEEDING EXPERIMENTS, Nos. 1A AND 1B.

Table of Weights.

—	Weight at Commencement.	At end of 1st period.	At end of 2nd period.	At end of 3rd period.
	Pounds.	Pounds.	Pounds.	Pounds.
Experiment 1A. (20 per cent molasses)	10,670	10,886	10,870	10,930
Gain or loss		216 gain.	16 loss.	60 gain.
Experiment 1B. (30 per cent molasses)	10,930	10,933	10,903	10,764
Gain or loss		3 gain.	30 loss.	139 loss.

MILKING MACHINE.

In July, 1912, a Sharples Mechanical Milker was installed in the main barn with the idea of testing thoroughly this method of milking, and the machine in particular, as to commercial adaptation, economy of production, effect on cows, and on the quality of the milk produced.

The complete outfit consists of compressor, compression and vacuum tanks, piping and six milking units. A unit is made up of container, cover, four teat cups, pulsator and all rubber connections. The complete unit, which milks but one cow at a time, costs $110; compressor, tanks, piping, etc., $110 extra. Cost of total installation, including electric motor, fittings, labour and all incidentals, $1,043.

While this machine has been in continuous use, barring intervals approximating a month's duration in all when, for purposes of comparison, the use of the milker was discontinued—the data obtained are not as yet sufficiently complete to warrant a final report at this time. Nevertheless, certain general facts have so established themselves that their mention may not be out of place. In this connection, reference should be made to the following table which contains the results of hand *versus* machine milking in successive two-week periods, from January 26, 1913 to April 5, 1913.

TEN WEEKS' TEST, MACHINE vs. HAND MILKING ON A HERD OF 14 COWS.

—	Machine.		Hand.		Machine.		Hand.		Machine.	
	Jan. 26 to Feb. 1.	Feb. 2 to Feb. 8.	Feb. 9 to Feb. 15.	Feb. 16 to Feb. 22.	Feb. 23 to Mar. 1.	Mar. 2 to Mar. 8.	Mar. 9 to Mar. 15.	Mar. 16 to Mar 22.	Mar. 23 to Mar. 29.	Mar. 30 to Apr. 5.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Total milk produced	2,281	2,298	2,216	2,148	2,079	1,926	1,978	1,894	1,806	1,671
Average per cent increase or decrease (weekly)	.....	·73 % inc.	3·7 % dec.	3·1 % dec.	3·4 % dec.	7·9 % dec.	2 6 % inc.	4·2 % dec.	4·6 % dec.	6·9 % dec.
Per cent decrease or increase during two weeks	....		3·4 % dec.		5·6 % dec.		1·6 % dec.		5 7 % dec.	

This test was initiated primarily to ascertain, if possible, the direct effect of the two methods on the quality of the milk as shown by bacterial content. While it is, then, chiefly of value from this standpoint, it also serves to show the comparative decrease in flow for the successive periods. To obtain exact figures on this point is difficult, as will be readily seen. Given two fairly balanced herds, the lactation periods of the individuals of which began at approximately the same time, the weekly decreases might be fairly compared. Such conditions, however, are difficult to obtain. While comparative figures from more detailed sources would go to show that mechanical milking exerts no marked influence on hastening the drying-off process, the figures from the table herewith given, favour hand milking, the percentage decrease being less during the weeks when the latter method was employed. Such indications, however, must be thoroughly substantiated by later findings, before being

regarded as conclusive. Incidentally, it might be mentioned that the cows in practically all cases show absolute indifference to the machine, responding well to its manipulation.

While the machine has shown an economy of labour in the stable of fully 50 per cent, this saving is considerably offset by the additional cost necessitated in the work of scrupulously cleaning and sterilizing the inflations, tubes, containers and all surfaces exposed directly to the milk. During the first six months, while the cleansing was given more than ordinary care, the bacterial count of the machine-produced milk averaged more than double that of clean hand milking. For the period during which the figures given were obtained, the cleansing and sterilizing operations were carried on with the aid of improved methods of washing, strictest attention to sterilizing and added precaution in the manipulation of the machine. Equal precautions were taken in hand milking. The figures indicate, however, a relatively high bacterial count in the case of the machine milk even under conditions as mentioned. While the counts in both cases were very low, it must be remembered that the test was conducted during cold weather under temperature conditions unfavourable to bacterial growth. Later tests taken during warm weather have shown marked increases in the bacterial content of the machine-produced milk.

It is the intention of this Division to publish a complete report of this test during the present fiscal year, as soon as sufficient data are at hand to warrant comprehensive treatment. For the present, however, the situation may be summed up as follows.

THE MECHANICAL METHOD OF MILKING.

1. Is mechanically feasible, the main cost of renewal being for the rubber lining of teat cups.
2. Apparently exerts some influence in hastening the end of the lactation period.
3. Is readily acceptable to the animal.
4. Offers difficulties in the way of proper cleansing of machine.
5. Makes difficult the production of low-count milk.
6. Materially reduces the labour of milking, but greatly increases the precautions and therefore the work necessary in the cleansing operations.

DAIRY HERD RECORDS.

The dairy cow milk records are reported upon by lactation periods rather than according to the fiscal year, as has been done previous to the year 1911-12. This change seemed advisable in that a cow's merits are usually calculated on a basis of her production per lactation period.

In the case of heifers with first calves, charges for feed include the consumption from a date two months previous to parturition, to the time of being dried. In the case of all following lactation periods the feed charges cover time from drying to drying.

In estimating the cost of feeding the following values were used:—

Pasture, per month	$ 1 per cow.
Meal mixture	25 per ton.
Clover hay	7 " "
Straw	4 " "
Roots and ensilage	2 " "
Green feed	3 " "

In calculating the value of the product, 30 cents per pound is allowed for the butter and 20 cents per 100 pounds for skim milk. In reality, a considerable quantity of milk conforming to the 'certified' standard was sold at $3 per 100 pounds, while the price of butter ranged from 28 cents to 35 cents per pound. The cream cheeses sold realized from $3.25 to $3.50 per 100 pounds milk, and Coulommier cheeses sold realized from $2.20 to $3.75 per 100 pounds milk.

However the figures chosen for calculation were regular market values and form a fair basis for comparison of the individuals in the herds with each other, as well as with the individuals of other herds.

In computing these returns, the bedding and the labour in connection with caring for the cows and manufacturing the butter have not been taken into account, nor have they been credited with the manure made, nor the value of their calves at birth.

All cows are reported upon that have finished a lactation period within the dates of the fiscal year 1912-13. This list does not, of course, include all cows that are at present in milk, as many are heifers not far advanced in their first lactation period.

DAIRY COW

RECORD OF DAIRY HERD

Names of Cows.	Age at beginning of Lactation Period.	Date of Dropping Calf.	Number of days in Lactation Period.	Total pounds of Milk for Period.	Daily average Yield of Milk.	Average per cent Fat in Milk.	Pounds of Butter produced in Period.	Value of Butter at 30c. per pound.
Centre View Bessie Ann........H.	3	Nov. 16, 1911...	470	16,136	34·3	3·46	657·11	197·13
Flavia (Imp.)............ .... A.	9	Mar. 25, 1911...	704	14,779	20·9	3·76	653·64	196·09
Boutsje De Boer Posch..........H.	3	Feb. 4, 1912...	365	13,285	36·4	3·53	552·67	165·80
Evergreen March 3rd.......... .H.	2	Oct. 28, 1911...	453	13,091	28 8	3·46	532·90	159·87
Inoquette 3rd ....C.	4	Feb. 29, 1912...	396	7,810	19·7	4·30	395·74	148·72
Ottawa Kate ....A.	4	Nov. 29, 1911...	367	10,451	28·4	3·97	488·35	146·50
Flavia 2nd of Ottawa...........A.	6	Jan. 20, 1912...	332	10,319	31·0	3·90	474·47	142·34
Ottawa Itchen's Favor........ . G.	2	April 24, 1911...	546	8,370	15 3	5·14	507·00	152·10
Denty 4th of Ottawa. ....A.	5	Feb. 5, 1912...	269	8,699	32·3	4·06	415·92	125·77
Ottawa Itchen......... ....G.	6	Dec. 5, 1911...	280	7,029	25·1	4·77	395·10	118·53
Dona Clatina . . .. A.	4	July 19, 1911..	562	7,825	13·9	5·26	484·70	145·41
La Belle.......... ....C.	4	May 16, 1911...	336	6,815	20·2	4·63	371·64	111·49
Rhoda 2nd's Maud ....H.	6	Feb. 24, 1912...	340	10,438	30·7	3·14	386·45	115 93
Denty 3rd of Ottawa. ....A.	6	June 14, 1911...	335	7,635	22·8	4·12	370·00	111·00
Marjorie 2nd of Ottawa. .... ..A.	5	Sept. 23, 1911...	312	7,617	24·4	4 08	366·00	109·80
Marjorie 6th of Ottawa..........A.	2	" 30, 1911...	384	7,203	18·7	4·41	374·32	112·99
Beulah Clay .. ..H.	5	Jan. 14, 1912...	388	9,178	23·9	3 32	359·41	107 82
Ottawa Kate 2nd......... . . A.	2	Nov. 4, 1911...	371	6,623	17·9	4·44	346·23	103·86
Marjorie 4th of Ottawa..........A.	3	Oct. 7, 1911...	298	6,480	21·7	4·26	325·24	97·57
Flavia 4th of Ottawa........ ...A.	2	Aug. 9, 1911...	357	7,087	19·8	3·96	330·44	99·13
Ottawa Deanie . . ..G.	2	Oct. 9, 1911...	335	4,780	14·2	5·65	317·76	95·32
Flavia 3rd of Ottawa...........A.	4	Jan. 25, 1912...	323	7,223	22·4	3·70	314·69	94·40
Duchess Perdue ....C.	4	June 22, 1911...	250	5,815	23 2	4·53	309·85	92·95
Fortune Precoce................C.	5	Jan. 26, 1912...	304	6,319	20 7	4·19	311·68	93·50
Maggie Pulchrae...............A.	3	April 25, 1912...	308	7,258	23·5	3·74	320·13	96·03
Fortune 4th d'Ottawa...........C.	4	Feb. 29, 1912...	289	5,834	20·1	4·15	285·07	85·52
Aromaz..... ... . C.	3	Mar. 28, 1911...	306	6,614	21·6	4·41	343·87	103·16
Itchen's Girl .. .. G.	2	Sept. 30, 1911...	244	4,996	20·4	4·94	290·20	87·06
Duchess Suavie........... .... C.	2	Oct. 28, 1911...	309	4,785	12·2	5·45	307·29	92·18
Jessy E. of Ottawa.............A.	4	July 26, 1911...	371	7,023	18·9	3·56	294·11	88·23
Fortune Cadette................C	2	Nov. 13, 1911...	292	4,950	16·9	4·71	274·58	82·37
Denty 6th of Ottawa .... A.	2	Sept. 6, 1911...	312	5,211	16·7	4·23	259·29	77·78
Soncy 3rd of Ottawa........... A.	3	Aug. 7, 1911...	359	6,148	17·1	3·83	278·12	83·43
Ruby's Pride........ .... .G.	2	Jan. 30, 1912...	305	4,341	14·2	5·26	269·00	80·70
Inoquette 4th..... ....C.	2	June 4, 1911...	362	4,866	13·4	4·59	262·47	78·84
Zaza Fille..... ....C.	3	Feb. 29, 1912...	306	5,436	17·7	4·10	262·60	78·78
Inoquette ....C.	8	Jan. 30, 1912...	426	5,772	13·5	4·59	311·64	93·49
Jessy D. of Ottawa. .... A.	6	Mar. 30, 1912...	287	5,415	18·8	4 09	266·70	80·01
Pearly's Maid..................G.	2	Oct. 20, 1911...	391	4,661	11·9	5·10	279·88	83·96
Zaza Fille 2eme............ ....C.	2	Sept. 12, 1911...	374	3,025	8·1	5·10	187·64	56·29
Average, 40 head	4	....	360	7,433	20 6	4·15	363·35	109·00

RECORDS.

—Central Farm.

Value of Skim Milk at 20c. per cwt.	Total Value of Product.	Amount of Meal Eaten, at 1¼c. per pound.	Amount of Roots and Ensilage Eaten, at $2 per ton.	Amount of Hay Eaten, at $7 per ton.	Amount of Green Feed, at $3 per ton.	Amount of Straw Eaten, at 20c. per cwt.	Months on Pasture, at $1 per month.	Total cost of Feed between Calvings.	Cost to Produce 100 pounds Milk.	Cost to Produce 1 pound Butter (skim milk neglected).	Profit on 1 pound Butter (skim milk neglected).	Profit on Cow between Calvings (labour and calf neglected).
30·94	228·07	4,158	21,490	2,437	3,555	976	1	90·26	55·9	13·7	16·3	137·81
28·24	224·33	4,289	29,747	3,515	5,760	1,645	1	105·65	71·4	16·1	13·9	118·68
25·46	191·26	3,564	20,230	2,677	3,585	971	1	82·45	61·9	14·9	15·1	108·81
25·10	184·97	3,664	21,655	2,679	3,555	895	1	84·94	64·8	15·9	14·1	100·03
14 83	163·55	2,477	17,155	2,178	3,340	891	1	63·52	81·3	16·0	14·0	100·03
19 97	166·47	2,894	16,340	2,185	3,380	682	1	67·58	64·6	13·8	16·2	98·89
19·69	162·03	2,668	17,720	2,341	3,380	787	1	66·90	64·8	14·1	15·9	95·13
15·72	167·82	3,006	18,349	2,490	5,380	1,045	1	75·78	90·5	14·3	15·7	92·04
16 56	142·33	2,240	12,030	1,551	3,380	591	1	52 70	60·5	12·7	17·3	89·63
13·26	131·79	1,966	12,025	1,659	3,380	567	1	49·59	70·5	12·5	17·5	82·20
14·68	160·09	3,107	20,281	2,395	5,550	1,027	1	78·37	100·1	16·1	13·9	81·72
12·88	124·37	2,047	13,162	1,716	2,320	915	1	51·05	74·9	13 7	16·3	73·32
20·10	136·03	2,767	15,353	1,518	3,555	609	1	62·78	60·1	16·2	13·8	73·25
14·53	125·53	2,110	15,029	1,983	2,370	1,085	1	54·00	70·7	14·5	15·5	71·53
14·50	124·39	2,329	12,522	1,586	2,920	686	1	52·93	69·4	14·4	15·6	71·37
13·65	126 64	2,166	15,462	2,208	3,380	598	1	57·53	79·8	15·3	14·7	69·11
17·62	125·44	2,438	17,103	1,933	3,585	368	1	61·93	67·4	17·2	12·8	63·51
12·55	116·41	2,166	14,926	2,052	3,075	606	1	56·04	84·7	16·1	13·9	60·37
12·31	109·88	1,656	12,428	1,573	2,890	685	1	49·66	76·6	15·2	14·8	60·22
13·51	112·64	2,128	13,554	1,485	4,326	601	1	53 42	75·3	16·1	13·9	59·22
8·92	104·24	1,845	11,037	1,481	3,260	536	1	46·24	96·9	14·5	15·5	58·00
13·80	108 20	1,926	13,610	1,679	3,380	652	1	50·93	70·5	16·2	13·8	57·27
11·00	103·95	1,650	13,077	1 623	3,470	615	1	46·79	80·4	15·1	14 9	57·16
12·00	105·50	1,983	12,517	1,617	3,350	641	1	50·24	79·3	16·1	13·9	55·26
13·88	109·91	2,160	16,210	1,812	3,380	713	1	57·05	78·6	17·8	12·2	52·86
11·03	96·60	1,783	11,447	1,441	3,270	542	1	45·73	78·3	16·0	14·0	50 87
12·54	115·70	3,085	13,763	1,639	3,380	640	1	65·42	98·9	19·0	11·0	50·28
5·40	92·46	1,748	10,712	1,748	2,060	600	1	43·96	87·8	15·1	14·9	48·50
8·94	101·12	1,990	14,897	2,174	3,210	610	1	54·39	113·6	17·7	12·3	46·73
13·44	101·67	2,089	14,341	1,503	4,420	871	1	55 08	78·4	18·7	11·3	46·59
9·34	91·71	1,804	10,675	1,512	3,270	546	1	45·49	91·9	16·9	13·1	46·22
9·90	87·68	1,749	10,136	1,428	2,140	578	1	42·34	81·2	16·3	13·7	45·34
11·74	95 17	2,083	12,526	1,495	3,155	734	1	49·93	81·2	17·9	12·1	45·24
8·14	88·84	1,646	11,486	1,627	3,260	633	1	44·89	103·4	16·6	13·4	43·95
9·20	88·04	1,588	12,524	1,771	2,042	900	1	44·40	91 2	17·0	13·0	43·64
10·34	89·12	1,674	12,477	1,637	3,260	604	1	46·21	85·0	17·6	12·4	42·91
10·92	104·41	2,352	17,164	2,124	3,210	872	1	61·54	106·6	19·7	10·3	42·87
11·28	91·29	1,702	15,030	1,678	3,380	700	1	49·64	91·6	18·6	11·4	41 65
8·76	92·72	2,215	13,799	2,127	3,260	604	1	56·01	120·1	20·0	10·0	36 71
5·66	61·95	1,655	13,330	2,042	3,070	510	1	47·78	157·9	25·5	4·5	14·17
14·14	123 14	2,314	14,932	1,907	3,397	733	1	58·02	78·0	15·9	14·1	65·12

RECORD OF DAIRY HERD.—

HOLSTEINS.

Name of Cows.	Age at beginning of Lactation Period.	Date of Dropping Calf.	Number of days in Lactation Period.	Total pounds of Milk for Period.	Daily average Yield of Milk.	Average per cent Fat in Milk.	Pounds of Butter produced in Period.	Value of Butter at 30c. per pound.
Centre View Bessie Ann........H.	3	Nov. 16, 1911..	470	16,136	34·3	3·46	657·11	197·13
Boutsje De Boer Posch. ....H.	3	Feb. 4, 1912...	365	13,285	36·4	3·53	552·67	165·80
Evergreen March 3rd.......... .H.	2	Oct. 28, 1911...	453	13,091	28·8	3·46	532·90	159·87
Rhoda 2nd's Maud............ H.	6	Feb. 24, 1912...	340	10,438	30·7	3·14	386·45	115·93
Beulah Clay....................H.	5	Jan. 14, 1912...	388	9,178	23·9	3·32	359·41	107·82
	4	....	403	12,425	30·8	3·38	497·71	149·31

AYRSHIRES.

Name of Cows.	Age	Date of Dropping Calf.	Days	Total Milk	Daily Yield	Fat %	Butter	Value
Flavia (Imp.)..................A.	9	Mar. 25, 1911...	704	14,779	20·9	3·76	653·64	196·09
Ottawa Kate............. . ...A.	4	Nov. 29, 1911...	367	10,451	28·4	3·97	488·35	146·50
Flavia 2nd of Ottawa .. ..A.	6	Jan. 20, 1912...	332	10,319	31·0	3·90	474·47	142·34
Denty 4th " ....A.	5	Feb. 5, 1912...	269	5,211	32·3	4·06	415·92	125·77
Denty 3rd " ....A.	6	June 14, 1911...	335	7,635	22·8	4·12	370·00	111·00
	6	....	401	9,679	27·1	3·96	480·47	144·14

GUERNSEYS.

Name of Cows.	Age	Date of Dropping Calf.	Days	Total Milk	Daily Yield	Fat %	Butter	Value
Ottawa Itchen's Favor......... G.	2	April 24, 1911...	546	8,370	15·3	5·14	507·00	152·10
Ottawa Itchen ....G.	6	Dec. 5, 1911..	280	7,029	25·1	4·77	395·10	118·53
Dona Clatina......... ....G.	4	July 19, 1911...	562	7,825	13·9	5·26	484·70	145·41
Ottawa Deanie...................G.	2	Oct. 9, 1911...	335	4,780	14·2	5·65	317·76	95·32
Itchen's Girl ....G.	2	Sept. 30, 1911...	244	4,996	20·4	4·94	290·20	87·06
	3	....	393	6,600	17·8	5·15	398·95	119·68

CANADIANS.

Name of Cows.	Age	Date of Dropping Calf.	Days	Total Milk	Daily Yield	Fat %	Butter	Value
Inoquette 3rd...................C.	4	Feb. 29, 1912...	396	7,810	19·7	4·30	395·74	148·72
La Belle.... ....C.	4	May 16, 1911...	336	6,815	20·2	4·63	371·64	111·49
Duchess Perdue..................C.	4	June 22, 1911...	250	5,815	23·2	4·53	309·85	92·95
Fortune Precoce............... .C.	5	Jan. 26, 1912...	304	6,319	20·7	4·19	311·68	93·50
Fortune 4th d'Ottawa...........C.	4	Feb. 29, 1912...	289	5,834	20·1	4·15	285·07	85·52
	4	....	314	6,519	20·7	4·36	334·79	106·43

Central Farm—*Continued.*

HOLSTEINS.

Value of Skim Milk at 20c. per cwt.	Total Value of Product.	Amount of Meal Eaten, at 1¼c. per pound.	Amount of Roots and Ensilage Eaten, at $2 per ton.	Amount of Hay Eaten, at $7 per ton.	Amount of Green Feed, at $3 per ton.	Amount of Straw Eaten, at 20c. per cwt.	Months on Pasture, at $1 per month.	Total cost of Feed between Calvings.	Cost to Produce 100 pounds Milk.	Cost to Produce 1 pound Butter, (skim milk neglected).	Profit on one pound Butter, (skim milk neglected.)	Profit on Cow between Calvings, (labour and calf neglected.)
30·94	228·07	4,158	21,490	2,437	3,555	976	1	90·26	55·9	13·7	16·3	137·81
25·46	191·26	3,564	20,230	2,677	3,585	971	1	82·45	61·9	14·9	15·1	108·81
25·10	184·97	3,664	21,655	2,679	3,555	895	1	84·94	64·8	15·9	14·1	100·03
20·10	136·03	2,767	15,353	1,518	3,555	609	1	62·78	60·1	16·2	13·8	73·25
17 62	125·44	2,438	17,103	1,933	3,585	368	1	61·93	67·4	17·2	12·8	63·51
23·85	173·16	3,318	19,166	2,249	3,567	764	1	76·47	62·0	15 6	14 4	96·69

AYRSHIRES.

Value of Skim Milk at 20c. per cwt.	Total Value of Product.	Amount of Meal Eaten, at 1¼c. per pound.	Amount of Roots and Ensilage Eaten, at $2 per ton.	Amount of Hay Eaten, at $7 per ton.	Amount of Green Feed, at $3 per ton.	Amount of Straw Eaten, at 20c. per cwt.	Months on Pasture, at $1 per month.	Total cost of Feed between Calvings.	Cost to Produce 100 pounds Milk.	Cost to Produce 1 pound Butter, (skim milk neglected).	Profit on one pound Butter, (skim milk neglected.)	Profit on Cow between Calvings, (labour and calf neglected.)
28·24	224·33	4,289	29,747	3,515	5,760	1,645	1	105·65	71·4	16·1	13·9	118·68
19·97	166·47	2,894	16,340	2,185	3,380	682	1	67·58	64 6	13·8	16·2	98·89
19·69	162·03	2,668	17,720	2,341	3,380	787	1	66·90	64·8	14·1	15·9	95·13
16·56	142 33	2,240	12,030	1,551	3,380	591	1	52·70	60·5	12·7	17·3	89.63
14·53	125·53	2,110	15,029	1,983	2,370	1,085	1	54·00	70·7	14·5	15 5	71·53
19·79	163·93	2,840	18,173	2,315	3,654	958	1	69·33	66·4	14·2	15·8	94·77

GUERNSEYS.

Value of Skim Milk at 20c. per cwt.	Total Value of Product.	Amount of Meal Eaten, at 1¼c. per pound.	Amount of Roots and Ensilage Eaten, at $2 per ton.	Amount of Hay Eaten, at $7 per ton.	Amount of Green Feed, at $3 per ton.	Amount of Straw Eaten, at 20c. per cwt.	Months on Pasture, at $1 per month.	Total cost of Feed between Calvings.	Cost to Produce 100 pounds Milk.	Cost to Produce 1 pound Butter, (skim milk neglected).	Profit on one pound Butter, (skim milk neglected.)	Profit on Cow between Calvings, (labour and calf neglected.)
15·72	167·82	3,006	18,349	2,490	5,380	1,045	1	75·78	90·5	14·3	15·7	92·04
13·26	131 79	1,966	12,025	1,659	3,380	567	1	49·59	70·5	12·5	17·5	82·20
14·68	160·09	3,107	20,281	2,395	5,550	1,027	1	78·37	100·1	16·1	13·9	81·72
8·92	104·24	1,845	11,037	1,481	3,260	536	1	46·24	96·9	14·5	15·5	58·00
5·40	92·46	1,748	10,712	1,748	2,060	600	1	43·96	87·8	15·1	14·9	48 50
11·59	131 27	2,334	14,481	1,954	3,926	755	1	58·79	89·2	14·5	15·5	72·49

CANADIANS.

Value of Skim Milk at 20c. per cwt.	Total Value of Product.	Amount of Meal Eaten, at 1¼c. per pound.	Amount of Roots and Ensilage Eaten, at $2 per ton.	Amount of Hay Eaten, at $7 per ton.	Amount of Green Feed, at $3 per ton.	Amount of Straw Eaten, at 20c. per cwt.	Months on Pasture, at $1 per month.	Total cost of Feed between Calvings.	Cost to Produce 100 pounds Milk.	Cost to Produce 1 pound Butter, (skim milk neglected).	Profit on one pound Butter, (skim milk neglected.)	Profit on Cow between Calvings, (labour and calf neglected.)
14·83	163·55	2,477	17,155	2,178	3,340	891	1	63 52	81·3	16·0	14·0	100 03
12·88	124·37	2,047	13,162	1,716	2,320	915	1	51·05	74·9	13·7	16·3	73·32
11·00	103·95	1,650	13,077	1,623	3,470	615	1	46·79	80 4	15·1	14·9	57·16
12·00	105·50	1,983	12,517	1,617	3,350	641	1	50 24	79·3	16·1	13 9	55·28
11·08	96·60	1,783	11,447	1,441	3,270	512	1	45·73	78·3	16·0	14·0	50·87
12·35	118·78	1,988	13,471	1,715	3,150	721	1	51·46	78·8	15·4	14·6	67·32

An increasingly large number of dairy farmers have availed themselves of the offer made by this Division to supply, free of cost, forms whereon to keep records of the milk yields of the individual cows in their herds. This is a gratifying indication of the advanced methods being adopted by our farmers.

As there apparently are many farmers who, as yet, have not availed themselves of this offer, being in ignorance of this distribution, the week-long milk records here illustrated shows the simplicity and utility of same.

The forms for distribution are as follows:—

Month long.—Daily milk records suitable for herds numbering up to twenty-two cows.

Week long.—Daily records for herds of sixteen cows.

Week long.—Daily records for herds of twenty-four cows.

Monthly summary records.

Yearly summary records.

Feed record forms.

DAILY MILK RECORD.

Herd belonging to........................
Post Office...........................
Record for week ending....................

This form supplied free by Live Stock Division, Central Experimental Farm, Ottawa, Ont.

COWS.

Day.	Time.								Total for day.
Sunday.	Morning....	....	....	....	....	....	....	....	
	Evening....	....	....	....	....	....	....	....	
Monday.	Morning....	....	....	....	....	....	....	....	
	Evening....	....	....	....	....	....	....	....	
Tuesday.	Morning....	....	....	....	....	....	....	....	
	Evening	....	....	....	....	....	....	....	
Wednesday.	Morning....	....	....	....	....	....	....	....	
	Evening....	....	....	....	....	....	....	....	
Thursday.	Morning....	....	....	....	....	....	....	....	
	Evening....	....	....	....	....	....	....	....	
Friday.	Morning....	....	....	....	....	....	....	....	
	Evening....	....	....	....	....	....	....	....	
Saturday.	Morning....	....	....	....	....	....	....	....	
	Evening	....	....	....	....	....	....	....	
Total. ...	Week.	....	....	....	....	....	....	....	

Remarks :

[Reverse side of Record Form.]

CENTRAL EXPERIMENTAL FARM.

J. H. Grisdale, *Director.* E. S. Archibald, *Dominion Animal Husbandman.*

Milk Records.

1. The profitable dairy cow must give over 5,000 pounds of milk each year. To know the value of a cow her total annual yield of milk must be known. The only way to know this is to keep a record of her daily milk yield.

2. The form on the other side of this sheet is intended to help progressive dairy farmers by supplying them with a simple and convenient sheet for the keeping of the milk records of their individual cows. A study of such records will soon indicate which cows should go to the butcher. We should be pleased to receive a summary of your record. If you have no summary forms write us.

3. Such records are being kept by hundreds of successful dairymen to-day. Many of these men attribute their success to the keeping of such records. Why not give the thing a trial if you are a dairyman? It will increase your milk product. It will lighten your labour, since your interest will be increased in your work and 'interest lightens labour.' It will show you the unprofitable cow, the 'boarder.' You cannot get rid of her too quickly.

4. For weighing the milk a simple legal spring balance may be secured for from one and a half to four and a half dollars. If your local dealer cannot supply you write the undersigned for particulars. A small platform scale is fairly convenient, but we find the spring balance preferable.

5. Many farmers keep records of the amount of food fed to individual cows. If you would like to do so, sample forms would be sent free on writing E. S. Archibald, Dominion Animal Husbandman, Central Experimental Farm, Ottawa, Ont.

DISPOSAL OF MILK.

For a number of years the milk produced on the Central Experimental Farm was manufactured into butter and the skim milk fed to calves or pigs, this, of course, with the exception of the small amounts of milk and cream sold daily to people living on the Farm. Milk sold in this way has, during the past twelve years, netted an average price of about $1.65 per hundred pounds of milk. The average milk from our herd shows about 4½ per cent butter fat. Our butter has usually commanded a slightly higher price than the current market. During the past year, for example, it sold at an average price of 33 cents per pound, with a range of 28 cents to 35 cents. The skim milk is valued at 20 cents per hundred pounds when feeding to calves or pigs. The manufacture of butter and utilization of skim milk and buttermilk for feeding purposes is continued on about the same scale as previously. However, as the herd has grown, we have had to look for different methods of disposal of the surplus milk. Consequently, in the year 1911, experimental work along the lines of cheese making was commenced.

CHEESE MAKING.

During the past year, work was continued in the manufacture of soft cheeses as well as Canadian Cheddar cheese. For full particulars as to the manufacture of the same, I would refer those interested to the Report of the Dominion Agriculturist for the year 1911, as well as to special bulletins published by the Dairy and Cold Storage Commissioner, Department of Agriculture, Ottawa. However, a brief note on each of these, relative to the amounts of material required and the demand for produce, might be of interest.

Our Cream cheese are made daily, and are marketed 24 hours after manufacture. Twenty pounds of milk, testing 4½ per cent fat, to which is added 4 pounds of cream, testing 20 per cent fat, will make fourteen cheeses, each weighing about 6 ounces; hence, in present methods of manufacturing, 100 pounds of 4½ per cent milk will make thirty-five or thirty-six cheese. These cheeses sell at 15 cents retail and 11

cents each wholesale. The demand for this type of cheese is growing rapidly and far exceeds our possible output. Many private dairies, with ready railway transportation, could work up permanent and profitable markets in our large Canadian cities.

Coulommier cheese, too, is a very popular type of soft cheese which requires but little expenditure for equipment and is easily made and ripened. One hundred pounds of milk, testing $4\frac{1}{2}$ per cent butter fat, is making twenty Coulommier cheese of about one pound each. These also bring, on our local market, 15 cents each retail and 11 cents wholesale.

Only a small amount of Canadian Cheddar cheese was manufactured during the past year for the reasons that a suitable curing room in the old dairy building was not available, the surplus of milk was not sufficiently great, the opportunities for experimental work with our limited facilities were extremely small, and the returns per hundred pounds of milk were less than one-half that made by manufacturing milk into soft cheese. It is hoped that with the greater facilities of a proposed new dairy building, the experimental work in all branches of cheese manufacture may be extended.

CERTIFIED MILK.

This new line of dairy experimental work, together with many co-related experiments, has been started during the past year. Although considerable valuable data have been gathered, this is insufficient to give conclusive and detailed information.

Certified milk is milk which conforms to certain requirements as to health of the herd, health of the stablemen, light, ventilation, sanitation and cleanliness of stable, methods of handling, and finally the comparative freedom of the milk from bacteria. For Ontario, certified milk should not contain more than 5,000 bacteria per cubic centimeter during the winter months, and 10,000 per c.c., during the summer months.

This milk nets us $3 per hundred weight, in bulk. Many difficulties have been met, and in overcoming the same, valuable information has been gained as to the extra cost of production of this product, the most advantageous procedures and their feasibility for the Canadian dairyman.*

The bacteriological testing included in this work has been most ably conducted by Miss L. Dean, with the assistance of the Dominion Botanist, Mr. H. T. Güssow.

FINANCIAL STATEMENT OF DAIRY CATTLE.

Below are submitted inventory and returns from dairy cattle on the Central Farm under my charge during the year April 1, 1912 to March 31, 1913.

—	April 1, 1912.		March 31, 1913.		Returns, including sales of dairy produce, breeding cattle, and bull service.	Gross returns made up of increase in value of products and value of animals sold.
	No.	Value. $	No.	Value. $	Value. $	
Dairy cattle	98	17,155 00	138	22,289 00	11,008 00	$16,142 30

* Detailed results of this work will appear during the coming year in a separate publication.

SUMMARY OF LIVE STOCK OPERATIONS.

RETURNS.

Gross returns	$16,142.00
Manure, 800 tons at $1 per ton	800.00
	$16,942.00

EXPENDITURES.

Value of foods consumed	$ 6,880.00
Cost of labour	2,776.00
Cost of new stock purchased	3,097.00
	$12,753.00
Net balance from dairy cattle	$4,189.00

NEW DAIRY BARN.

It was found necessary to build a small cow barn for the accommodation of 24 milch cows. The purpose of this barn was as follows:—

1.—To provide accommodation for more cows than could be housed in the main breeding barn, the product from which to be used in the dairy manufacturing experimental work.

2.—To provide also a room to be fitted and used especially for the work on digestibility of food stuffs for cattle. This is a very important branch of Animal Husbandry work which will be conducted co-operatively with the Chemical Division.

3.—To stand as a good type of complete modern barn construction as to capacity, strength and lightness of structure, durability, capacity, convenience, light and ventilation, and in which both healthy cattle and pure milk may be produced.

4.—To contain specially constructed features such as the mangers, provided to give ideal conditions for the conducting of dairy cattle feeding experiments.

BARN PLAN.

The accompanying plans (Plates XXVII and XXVIII) together with the photos are, for the most part, self-explanatory. A few additional remarks may, however, help make some points more intelligible.

1. Foundation.

The foundation is of concrete. A concrete wall footing is 18 inches wide. The concrete wall, which extends 1 foot above the floor level, is 1 foot in thickness, and to which the sill is bolted. A 3-inch tile just below and outside the footing was installed to prevent heaving and cracking of foundation wall.

2. Superstructure.

The superstructure is of wood, hip roof, plank frame, and roof covered with metal shingles. The whole frame is made of 2 x 6-inch plank, excepting joists and girths, which are made with 2 x 10-inch planks. The sills, purlins and plates are made of 2 ply 2x6-inch plank. The hipped roof is made up of 2x6-inch rafters covered with inch boards, paper and best quality metal shingles. No posts are in the loft, as the roof and purlins are supported by the plank frame trusses, which too are made of 2x6-inch plank.

The walls, from the outside, are battens, 1-inch planed boards, building paper, posts built from 2 x 6-inch plank, a thick patent fibre wall paper called 'Linofelt' and on inside ⅞-inch matched lumber. The ceiling of barn is also sheathed with seven-eighths lumber.

Iron posts, 3½-inch, support the floor of loft.

3. *Dimensions.*

The barn is 41 by 78 feet, outside measure. The ceiling of stable is 10 feet in height. The wall post in loft is 9 feet in height.

The cattle stands from end to end are of different lengths, one varying from 5 feet to 4 feet 8 inches, the other from 4 feet 10 inches to 4 feet 6 inches. The stalls are 3 feet 6 inches in width. The feed passage is 6 feet 2 inches wide, while the manure passages vary in width from 7 feet to 7 feet 4 inches. The mangers are 21 inches wide, with rounded bottoms. The gutters are 18 inches wide, with sloping bottoms.

4. *Cement Finish.*

The one foot of cement wall above the floor, the milk- and wash-room floors, the mangers and gutters were finished perfectly plain and smooth.

Feed passages were given a smooth finish, and then rolled.

Cattle stands were given a rough wood floor finish.

Manure passages were given a rough finish, and then lightly cross-lined and rolled.

Although somewhat harder to keep clean than a finish without the cross lining, yet it is perfectly safe for cattle to walk on with no danger of slipping, even though the floor is wet.

5. *Levels.*

The floors, excepting feed room and digestion room, are of concrete. All passages, including the manure passages and feed passage, are on the same level. The stands are two and one-half inches higher than the manure passages. The manger bottoms are one and a half inches higher than the front of stands. The divisions between mangers and stands also are of concrete, cut down at throat of cattle to a height of 7 inches above front of stand and 5½ inches above manger bottom. The front of mangers is of concrete, 4 inches thick and having a height of 2 feet above feed passage. The gutters are 8 inches deep next the stand and 6 inches deep next the passage.

6. *Slopes.*

The stands have a slope of one and a half inches from front to rear.

The main feed passage is one inch higher in the centre than next the manger fronts. A graded groove next manger leads to traps in gutters to provide for floor washing.

The manure passages slope from walls to gutters, one inch in seven feet. The bottom of gutter is one-half inch higher next cattle than next passage and slopes from one end to the other at the rate of 1 inch in 18 feet. These slopes facilitate the cleaning out of liquid manure as well as keeping clean the tails of cows. The sides of gutters are vertical.

7. *Light.*

As much light as the strength of walls would permit was here installed. Windows in walls and doors were made as large as possible. The cattle barn will accommodate 24 cows and is lighted by 468 square feet of glass, or at the rate of 19½ square feet per head. Direct sunlight reaches every part of the barn, which renders it most sanitary, bright and cheerful.

8. *Ventilation.*

A modified Rutherford system of ventilation is used in this barn, differing only in some minor details from the systems of the other barns.

Photo by Frank T. Shutt.

New Dairy Cattle Barn. Central Experimental Farm, Ottawa.

Note: (1) Ventilation system; (2) Milk Room Annex; (3) Method of handling manure; (4) Style of windows; Counter-weighted hay door in loft.

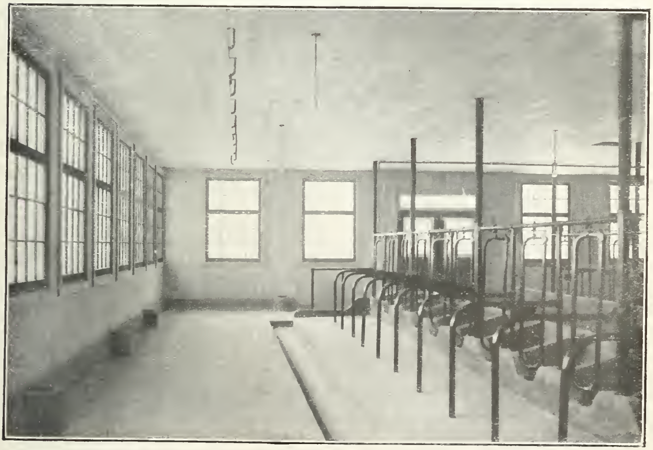


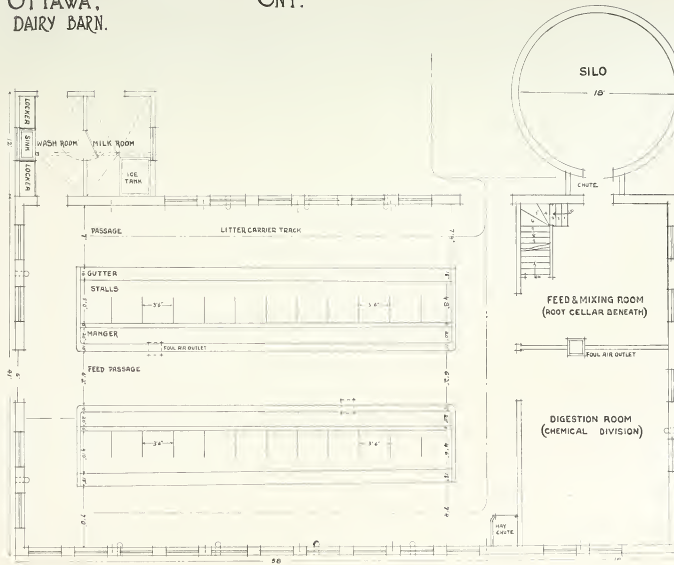
Photo by Frank T. Shutt.

New Dairy Cattle Barn. Central Experimental Farm, Ottawa. Interior View.

Note: (1) Lighting; (2) Ventilation, fresh air intake at floor; (3) Ventilation, foul air outlets at ceiling; (4) Cement passage and stands.

CENTRAL EXPERIMENTAL FARM OTTAWA, ONT.

DAIRY BARN.

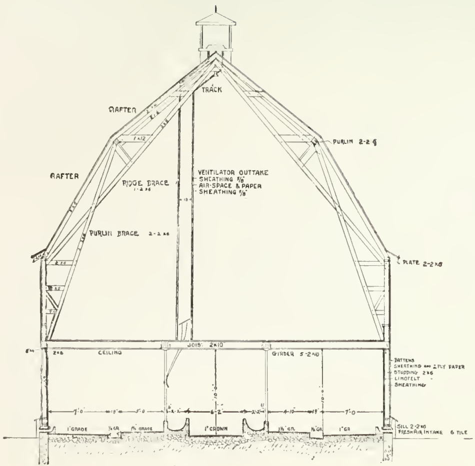


GROUND PLAN

(¼ in scale)

16—1914—p. 560

CENTRAL EXPERIMENTAL FARM
OTTAWA, ONT.
DAIRY BARN.



CROSS SECTION
(¼ IN SCALE)

NORTH ELEVATION
(¼ IN SCALE)

Fresh air is admitted through the walls at floor level and conducted to a height of one foot above floors. For this purpose, 6-inch sewer-pipe elbows were installed in the wall during construction. A cement casing guards this on the inside. Ventilator boxes on the outside of wall, extending 3 feet above pipe and with openings on sides at top prevent strong direct air currents, yet supply a uniform, adequate flow of fresh air to the barn.

The area of intake pipe per head is about 14 square inches.

The outlets are three in number, two of which are from the cow barn and one from the root cellar and digestion room. Each outlet is 18 inches square, inside diameter, and is thoroughly insulated to prevent condensation of moisture. These outlets are not placed in the centre line of building but alternately on each side, extend from ceiling of stable to roof and follow the roof to peak of barn, thus straddling the hay track in loft. The total area of outlet for the cow stable is 648 square inches, or 27 square inches per cow.

Both incoming fresh air and outgoing foul air currents are controlled by dampers, thus giving uniformity to both air currents and temperature.

The windows of this barn throughout are in two sashes, the upper of which is hinged to the lower and opens in from the top. They may be tilted in at any angle by means of a cord operating a small pulley on a worm spindle. This is easy to operate, is cheap, and prevents the slamming of windows. When warm weather necessitates more air current than admitted through the fresh air intakes, the windows are opened as needed.

The ventilation of the root cellar is on the same plan, although differing somewhat in construction. Fresh air is conducted through the walls at a height of 6 feet above the floor. Slatted flues conduct the air downward to slat sided floor ventilators, which in turn converge to the foul air outlet in centre. The latter is slatted to within 6 inches of the ceiling, from which it is insulated to the outlet on roof. Both the intakes and outlet are controlled by dampers. The roots in this cellar cool and dry very rapidly in the fall and have kept exceptionally well to date.

9. *Accommodation.*

The cattle barn will accommodate 24 milch cows standing in all-steel stalls and tied by means of swinging steel stanchions.

The digestion experimental room will accommodate two animals and all necessary appliances.

A separate wash and locker room with well-equipped milk room adjoining, facilitates cleanliness of the barn, the stablemen and the milk.

A root cellar, under the feed and digestion rooms, accommodates 3,000 bushels of roots.

A meal room over feed room is fitted with bins. Meal chutes convey meal to the feed room below. A cut-straw chute also leads into feed room.

A silo, opening into feed room, has over 200 tons capacity. This will provide summer as well as winter silage.

A litter carrier is installed, which takes manure to a short line track outside of barn and drops it into a vehicle, in which manure is hauled direct to field.

An important feature in this barn is a dust proof hay chute which conveys the hay from loft to the floor of stable. Experiments already conducted have proven the great worth of this in eliminating the bulk of dust from the stable atmosphere, thus facilitating the keeping of barn clean, and the production of pure and certified milk.

The distribution of feed is done by means of two low, three-wheel trucks. The meal truck is fitted with bins, hence will accommodate several kinds of meal. Experience with these trucks, as well as the suspended feed carriers, has resulted most favourably to the former method.

10. *Water.*

Individual basins provide water for each cow. As the underfeed system was well illustrated in the main cattle barn, it was decided to install an overhead feed system in this building. Results to date have been quite satisfactory.

FARM BUILDING PLANS.

There is now at the Central Experimental Farm, probably the most complete, modern and perfect system of live stock barns which represent the best types that can be found in Canada.

Inquiries as to details of these building plans are coming, in increasing numbers, from all parts of Canada. Consequently, this Division each year has been assisting an increasingly large number of farmers in planning either the erection of new, or the remodelling of their old buildings. Although this takes a large amount of time, yet, considering the most undesirable state of the average Canadian barn, it is felt that this work demands immediate attention. Farmers, anticipating the construction or remodelling of their farm buildings, may receive information along this line by writing the Division of Animal Husbandry, Central Experimental Farm, Ottawa.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT—J. A. CLARK, B.S.A.

Owing to the limited area of this farm, no dairy herd has as yet been established, but if the proposed farm extension materializes, a small dairy herd will be installed during the coming year.

At present the live stock work is limited to experimental feeding of beef-steers and lambs, together with the maintenance of necessary horses. One grade dairy cow only is kept as a milk supply to the farm houses. As an illustration of the possible profits from grade cows when well fed, the following record is detailed:—

DAIRY COW.

The cow calved April 6. There was no pasture available, so that she was stabled throughout the year, except for a few days in July, when she was tethered. She met with an accident on tether that reduced her milk from 33 pounds per day to 11. She gradually came up on her milk again but never returned to her former flow.

The following data were recorded:—

Number of days milking		319
Number of pounds of milk		8,290
Average per cent fat during June		4.25
Amount of hay fed, counted for 1 year	lb.	3,326
Amount of oats fed, counted for 1 year	"	1,573
Amount of bran fed, counted for 1 year	"	2,687
Amount of roots fed, counted for 1 year	"	15,724
Ninety days feed on soiling crop	"	4,500
Cost of feed	$	86 30
Value of milk, 3,316 quarts at 5 cents per quart	$	165 80
Balance	$	79 50

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT—R. ROBERTSON.

DAIRY CATTLE GRADING EXPERIMENT.

OBJECT OF EXPERIMENT.

The object of this experiment is to discover the actual cash value of the pure-bred dairy sire in a herd of common and mixed breeding in the increased production of the progeny, as well as their proportionately greater market value.

OUTLINE OF EXPERIMENT.

Twelve heifers, born in 1909, were purchased in December, 1910, and bred at once to the pure-bred Ayrshire bull purchased at the same time. These heifers were of fair quality, but of common breeding, representing the average stock of this part of Nova Scotia.

Throughout the whole experiment the female progeny only shall be saved.

The first crop of calves are naturally half-bred Ayrshire grades, termed First Ayrshire Cross (A). All succeeding female progeny from these shall be bred to calve at two years of age, and only the best of pure-bred Ayrshire bulls to be used thereon. The first progeny from the First Ayrshire Cross (A) shall be termed 'Second Ayrshire Cross (A I)' and their progeny in turn 'Third Ayrshire Cross (A II),' and so on till the end of experiment.

A brief outline of the details of experiment would be as follows:—

1. Prepare the 'Foundation Heifers' and all succeeding female progeny for their calving by being in good condition.

2. Prepare for each succeeding calving by a four to eight weeks' rest and good conditioning.

4. Breed all ages for fall calving.

5. Breed 'Foundation Heifers' in the winter of 1910-11 to pure-bred Ayrshire bull; 1911-12 to pure-bred Holstein bull; 1912-13 to pure-bred Guernsey bull; 1913-14 to pure-bred Ayrshire bull; 1914-15 to pure-bred Holstein bull; 1915-16 to pure-bred Guernsey bull.

6. Breed the progeny of each of the first cross heifers only to bulls of the same breed as their sires.

7. The following diagram will give an idea as to nomenclature of the different generations from each original cow.

In this nomenclature please note:—

1. Each 'Foundation Heifer' will, in her heifers, originate a family. Hence her number should be incorporated into the number of all her progeny.

2. The year signifies the year of birth and, for ease in making diagram, is calculated as December of that year.

3. The diagram shows the possible progeny of each heifer in the six successive years of breeding, making no allowance for losses and figuring that all progeny are females.

4. All the original 'Foundation Heifers' should as much as possible be kept until the fall of 1917, in order to have complete comparative data.

5. This data includes the following:—
   - (*a*) Cost of rearing to first calving.
   - (*b*) Cost of feeding for each lactation period.
   - (*c*) Character and quantity of feeds for each lactation period.
   - (*d*) Milk, fat and butter produced in each lactation period.
   - (*e*) Profit produced in each lactation period.
   - (*f*) Photographic records of each and the progeny of each 'Foundation Heifer,' showing heredity as to quality, size and type.

Foundation Heifer, born 1909—No. 1

- First Ayrshire Cross 1 A.—1911.
  - Second Ayrshire Cross 1 A. 1—1913.
    - Third A.C. 1 A. 1.1.—1915.
      - Fourth A.C. 1 A. 1.1.1.—1917.
    - Third A.C. 1 A. 1.2.—1916.
    - Third A.C. 1 A. 1.3.—1917.
  - Second A.C. 1 A. 2—1914.
    - Third A.C. 1 A. 2.1.—1916.
    - Third A.C. 1 A. 2.2.—1917.
  - Second A.C. 1 A. 3—1915.
    - Third A.C. 1 A. 3.1.—1917.
  - Second A.C. 1. A. 4—1916.
  - Second A.C. 1 A. 5—1917.
- First Holstein Cross 1 H.—1912.
  - Second H.C. 1 H. 1—1914.
    - Third H.C. 1 H. 1.1.—1916.
    - Third H.C. 1 H. 1.2.—1917.
  - Second H.C. 1 H. 2—1915.
    - Third H.C. 1 H. 2.1.—1917.
  - Second H.C. 1 H. 3—1916.
  - Second H.C. 1 H. 4—1917.
- First Guernsey Cross 1 G.—1913.
  - Second G.C. 1 G. 1—1915.
    - Third G.C. 1 G. 1.1.—1917.
  - Second G.C. 1 G. 2—1916.
  - Second G.C. 1 G. 3—1917.
- First Ayrshire Cross 1 A.S.—1914.
  - Second A.C. 1 A.S. 1—1916.
  - Second A.C. 1 A.S. 2—1917.
- First Holstein Cross 1 H.S.—1915.
- First Guernsey Cross 1 G.S.—1916.

RESULTS OF EXPERIMENTS TO DATE, APRIL 1, 1913.

The twelve heifers termed 'foundation heifers' have all dropped their first calves, and, with one exception (Jean), have completed their first lactation periods.

The first crop of calves (first cross Ayrshire), calved in the fall of 1911, yielded seven heifers. These are being bred to a pure-bred Ayrshire bull, to calve during the fall of 1913.

The second crop of calves (first cross Holstein), calved in the fall of 1912, yielded six heifers.

All these progeny of the 'foundation heifers' are developing with promise of superiority to their dams.

FEEDING THE DAIRY CATTLE.

Owing to the excessive drought of the summer of 1912, the limited available pasture afforded insufficient forage, which shortage affected the milk flow to a certain extent. A limited meal ration helped to correct this deficiency.

On estimating the cost of feeds consumed, data were calculated from two months previous to calving until drying off at the completion of first lactation period. In future calculations, feed will be recorded from drying off to drying off.

DAIRY HERD RECORDS.

In compiling the following tables, meal was calculated at market values and roughages at the actual cost of production as follows:—

Hay	$ 7.00 per ton.
Meal mixture	30.00 " "
Roots	2.00 " "
Ensilage	2.00 " "
Pasture per month	1.00 per cow.

On calculating the value of the product, butter is valued at 26 cents per pound, and skim milk at 20 cents per cwt.

The value of bedding used and cost of labour have not been taken into account, but such are more than offset by the value of the manure and value of the calves.

DAIRY RECORDS.—

Name.	Age.	Date last Calf.	No. of days in Milk.	Daily average Yield.	Total Milk.	Fat.	Butter.
				Lb.	Lb.	p.c.	Lb.
Vera	3 years.	January 1, 1912.	315	17	5,369	3·5	221·07
Myrtle	3 "	" 1, 1912.	322	12·4	3,997	4·1	192·79
Georgie	3 "	Feb. 26, 1912.	310	12·9	4,016	3·9	184·26
Spot	3 "	January 1, 1912.	322	12·6	4,060	4·1	195·83
Maggie	3 "	" 1, 1912.	308	16·17	4,981	3·9	228·54
Jessie	3 "	" 1, 1912.	274	11·36	3,113	3·9	142·90
Mossy	3 "	" 9, 1912.	282	10·65	3,004	4·85	178·40
Bell	3 "	" 13, 1912.	330	16·56	5,465	3·9	250·74
Jean	3 "	March 11, 1912	295	19·03	5,615	3·55	234·51
Queen	3 "	January 4, 1912.	304	14·14	4,303	3·9	197·43
Ella	3 "	Feb. 26, 1912.	264	12·54	3,312	3·75	146·11
Molly	3 "	January 6, 1912.	302	11·03	3,333	3·8	149·00
Average 12 head	3 "		302	13·9	4,222	3·93	193·46

Nappan Farm.

Value of Butter at 26c. lb.	Value of Skim Milk at 20c. per 100 lb.	Total Value Product	Amount Meal eaten.	Amount Roots eaten.	Amount Hay eaten.	Pasture at $1.00 per month.	Total Cost.	Cost to produce 100 lb. Milk.	Cost to produce 1 lb. butter (Skim Milk neglected.)	Profit on 1 lb. butter.	Net profit between calves (labor and manure neglected.)
$	$	$	Lb.	Lb.	Lb.		$				$
57.47	10.29	67.76	1,728	12,190	3,751	4	55.22	102·8	24·9	1·1	12.54
50.12	7.60	57.72	1,399	12,190	3,751	4	50.30	125·8	26·0	0.0	7.42
47.90	7.66	55.56	1,390	12,190	3,751	4	50.17	124·9	27·2	-1·2	5.39
50.91	7.73	58.64	1,415	12,190	3,751	4	50.55	124·5	25·8	2	8.09
59.42	9.50	68.92	1,617	12,190	3,751	4	53.58	107·5	23·4	2·6	15.34
37.15	5.94	43.09	1,082	12,190	3,751	4	45.55	146·3	32·0	-6·0	-2.46
46.38	5.65	52.03	1,071	12,190	3,751	4	45.39	151·1	25·3	0·7	6.64
65.18	10.43	75.61	1,782	12,190	3,751	4	56.05	102·6	22·4	3·6	19.56
60.97	10.76	71.73	1,750	12,190	3,751	4	55.57	98·5	23·8	2·2	16.16
51.33	8.21	59.54	1,440	12,190	3,751	4	50.92	118·3	25·7	0·3	8.62
37.98	6.33	44.31	1,112	12,190	3,751	4	46.00	138·4	31·5	-5·5	-1.69
38.74	6.57	45.31	1,193	12,190	3,751	4	47.22	141·3	31·7	-5·7	-1.91
50.18	8.41	58.59	1,415	12,190	3,751	4	50.55	119·7	26·0	0·0	8.14

EXPERIMENTAL STATION, CAP ROUGE, P.Q.

REPORT OF THE SUPERINTENDENT—GUS. A. LANGELIER.

DAIRY CATTLE.

Although this herd is not yet two years old, there are now at the Station, 1 bull, 9 cows, 5 heifers, registered French Canadians; also ten cows, grades of the same breed, and four heifers from the grades and sired by a pure-bred bull.

The following table gives details as to milk production of the cows and heifers which had finished a lactation period when this report was made.

MILK RECORDS.

Name of cow.	Age— M. for Mature.	Date of dropping calf.	No. of days in lactation period.	Total pounds of milk in lactation period.	Daily average yield of milk.	Pounds of fat produced in period.	Average per cent of fat in milk.	Approximate weight of cow.	Rank as milk producer.	Rank as butter producer.
Gipsy.....................G.F.C.	M.	June 26, 1911	408	11,725	28·74	419·34	3·58	985	1	1
Flora. . ...G.F.C.	M.	March 29, 1912	340	6.852	20·15	319·51	4·66	1,125	2	2
Jeannette de St. Denis, 2,409 ....F.C.	M.	April 27, 1912	337	6,453	19·15	303·74	4·71	860	3	3
Bella....... ..........G.F.C.	M.	May 6, 1912	329	5,673	17·24	254·68	4·49	1,060	5	4
Amanda................G.F.C.	M.	May 4, 1912	311	5,678	18 26	245·03	4·32	925	4	5
Meilleure, 142.......... ..F.C.	M.	Feby. 22, 1912	319	5,642	17·69	234·33	4·15	875	6	6
Exhilée de Kamouraska, 2,414.... ... .F.C.	2	April 5, 1912	358	4,265	11·91	215·92	5·06	625	10	7
Finette 2ème, 218..........F.C.	M.	April 6, 1912	263	4,851	18·44	200·34	4·13	935	7	8
Christine....... ...G.F.C.	M.	May 25, 1912	285	4,350	15·26	198·44	4·56	930	9	9
Kate.. .. ..G.F.C.	M.	April 16, 1912	316	4,201	13·29	192·67	4·59	940	11	10
Simonne, 2,259.... .... ..F.C.	M.	June 13, 1912	271	4,154	15·33	192 59	4·64	850	12	11
Eva.... ...............G.F.C.	M.	March 25, 1912	257	4,360	16·96	186·74	4·28	1,025	8	12
Hilda..................G.F.C.	M.	April 26, 1912	243	4,004	16·48	183·24	4·58	1,050	13	13
Frisée, 1,612............ F.C.	M.	April 27, 1912	352	3,644	10·35	180·40	4·95	885	16	14
Irène .................G.F.C.	3	May 12, 1912	266	3,688	13·86	175·80	4·77	1,130	15	15
Gloire, 2,397............ F.C.	M.	April 21, 1912	266	3,774	14·18	168·40	4·46	1,025	14	16
Totals and averages..... . ..	....	....	4,921	83,314	16·93	3,671·17	4 41	952		

It will be seen that fourteen mature cows, one three-year-old and one two-year-old heifer, milked during 4,921 days, and gave during that time, 83,314 pounds of milk containing 3,671.17 pounds of butter fat, or 16.93 pounds of milk per day testing 4·41. The average weight of these cattle was 952 pounds. The average production was 5,207 pounds of milk containing 229·45 pounds of butter fat. It is interesting to note that only six cows went over this, and if the rest of the sixteen had averaged the same, viz., 7,003 pounds of milk containing 296·10 pounds of butter fat, the total production would have been 112,048 pounds of milk instead of 83,314 and 4,737·60 pounds of butter fat instead of 3,671·17, or a difference of 28,734 pounds of

milk and 1,066·43 pounds of butter fat. And this is what happens in nearly all the herds of the country, the robber cows dragging down the average, too often below the paying line. This would show that the farmer who weighs the milk and tests it can get rid of the bad cows, whilst the other continues to keep them instead of being kept by them.

For experimental purposes, these cows should be kept through another or perhaps two other lactation periods, to be able to make an average of their production of two or more years and also to get at least one heifer by a registered bull, out of each. As soon as a heifer is obtained from a 'robber' cow which has gone through two lactation periods, the latter can be discarded. It will be interesting to compare the milk yield, butter fat test, and weight of these heifers with that of their dams.

After Gipsy, the best milker was purchased and it was seen that she promised to be much above the average, both her dam and daughter were purchased. At the beginning of the lactation period, Gipsy was 7, her dam, Hilda, was 10, and her daughter, Irène, 3 years of age. The purchase of the dam and daughter did not prove a very profitable one as far as their producing capacity is concerned, for they are both below the average. This would tend to confirm Dr. Raymond Pearl's contention that the producing capacity is transmitted rather through a male out of a high producing dam, than through the high producing dam herself. However, it will be interesting to watch the production of these three cows.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT—W. C. McKILLICAN, B.S.A.

DAIRY CATTLE.

There are thirty-nine head of cattle on hand, on March 31, 1913, made up as follows:—

Shorthorn: 18 milch cows, 15 heifers and calves, 2 bulls;
Ayrshire: 1 milch cow, 1 heifer;
Grade: 1 milch cow, 1 heifer.

The Shorthorns are of the dual purpose type, having been bred for milk production as well as beef. The herd includes the descendants of cows selected from some of the best English dairy Shorthorn herds a number of years ago.

During the year the following animals were sold, to farmers of Manitoba and the other Prairie Provinces, to be used for breeding purposes: 8 young Shorthorn bulls, 7 Shorthorn heifers or cows, and one Ayrshire bull calf. There is a great demand for dual purpose Shorthorns, and a much larger number of sales could have been made, if the animals had been available.

The dairy milk records are given by lactation periods, instead of by the fiscal year, as formerly. This gives a fairer comparison of the milking qualities of the cows, and is the way in which milk yields are usually counted. The following are the cows that have completed a lactation period during the year. Several younger cows, that have dropped their first calf during the year and are still milking, are not reported. A number of the cows in this list have since been sold or slaughtered.

DAIRY RECORD.—Brandon Farm.

Name of Cow.	Breed.	Age at beginning of lactation period.	Date of dropping calf.	Number of days in lactation period.	Total pounds of Milk for period.
Illuminata 3rd	Shorthorn	7	Nov. 25, 1911.	443	10,287
Ottawa Marchioness 5th	"	2	Aug. 30, 1911.	431	8,322
Snowball	Ayrshire	7	Mar. 21, 1911.	400	6,719
Ottawa Molly 4th	Shorthorn	3	Aug. 12, 1911.	438	6,201½
Rose of Brandon	"	9	Apr. 16, 1912.	305	5,832½
Ottawa Marchioness 2nd	"	6	Nov. 23, 1911.	331	5,803
Ottawa Janet 2nd	"	3	Aug. 7, 1911.	349	5,773½
Daisy of Brandon	"	8	April 1, 1912.	271	5,530½
Buttercup	Grade	5	July 11, 1911.	305	5,507
Illuminata 4th	Shorthorn	6	Feb. 22 1912.	306	5,410
Ottawa Lass	"	9	Aug. 4, 1911.	405	5,180
Jessica Elmhurst 3rd	"	4	July 31, 1911.	324	4,924½
Jane of Brandon	"	6	Mar. 6, 1912.	227	4,351
Ottawa Marchioness 4th	"	3	Dec. 23, 1911.	372	4,263
Molly 2nd	"	10	Mar. 2, 1912.	237	4,250½
Duchess 3rd	"	4	Sept. 26, 1911.	262	3,880½
Molly 3rd	"	5	Jan. 19, 1912.	272	3,722½
Brandon Beauty	"	3	May 16, 1912.	227	2,939½
Ottawa Marchioness	"	9	Jan. 23, 1912.	326	2,848½
			Average		5,039

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT—G. H. HUTTON, B.S.A.

DAIRY CATTLE.

A herd of Holstein Friesian cattle was established during the year.

The Holstein herd consists of seventeen head, headed by 'Royalton Korndyke Count' (88884). The females in the herd are all young and out of heavy producing dams. 'Lawncroft Rosa Echo' (No. 15021), a heifer freshening at three years two months of age, has given 2,578 pounds of milk in seventy-seven days.

The Station owns four pure-bred Jersey females, one of which, freshening at twenty-three months of age, gave 8,200 pounds of milk in sixteen months.

The grade cows number seventeen, and are grades of Holsteins, Shorthorn and Ayrshire blood.

These grade cows will be divided into two herds, namely, Grade Holstein herd, Mixed blooded herd.

With each herd the dairy cattle grading experiment, as already under way at Nappan and other Farms, will be conducted, using the Holstein sires exclusively. The outline of this and data so far obtained will be reported next year.

The number of dairy cattle of all breeds and grades owned by this Station, is thirty-eight, all of which are in good condition.

BUILDINGS.

The following buildings were erected by day labour during 1912-13: Herdsman's cottage and woodshed, dairy barn, beef barn storage barn, dairy and ice-house.

The herdsman's cottage is 26 by 28 feet, with a kitchen at the back, 16 by 20 feet. It has a concrete foundation and a concrete floor in the cellar, which is 16 by 20 by 7 feet. There are three bedrooms on the ground floor, while the attic will provide accommodation for two beds. This building cost $1,721.31, which is $223.67 less by day labour than a similar but smaller cottage cost in 1907, under contract.

The plan of the dairy barn, beef barn and storage barn is produced herewith. The total number of cattle, young and old, which may be accommodated in these buildings, is about one hundred head. The total cost of the buildings, including fixtures, which cost $926.93, was $11,790.75. Concrete foundations and floors contribute a large percentage of this cost. The dairy provides an engine room and a manufacturing room, a room for storing supplies, and an office on the ground floor. There are three bedrooms on the second floor and a room to be equipped as a bathroom. The building is 24 by 32 by 19, on a concrete foundation, with a full-size basement, concrete floored.

The ice-house is 16 by 20 by 12. The dimension material is 2 by 4, sheathed, papered and drop-sided. It is sheathed inside and the space is filled with sawdust. In the building, ice to the amount of about eighty tons has been stored.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT—P. H. MOORE, B.S.A.

DAIRY STOCK.

There have been some changes and improvements in the dairy stock since last year's report. Of the twenty-eight grades which were received just prior to the last report, twenty-four still remain. Two were killed for beef and two for tuberculosis, the latter reacting under the first and second tests which were made by Dr. S. Hadwen, Health of Animals Branch. Both of these animals might have easily been passed as they were in fine condition and showed very belated reactions, but post mortem examinations showed generalized cases of tuberculosis. There have since been made two more very thorough tests and the herd passed each time. Absolutely thorough testing and lack of compassion on the suspect have brought about this state of affairs in the herd, and by allowing nothing but tested stock therein, it is hoped by the above methods to keep free from tuberculosis.

The cows have improved in condition very much since the last report, and those, except the very oldest, which are freshening now, give promise of much better returns than they gave in the period which is now being reported. They were on pasture all summer and this was supplemented at short intervals by green feed. When they came in they were given a ration of hay, mangels and silage, mixed in proportions of three, five and twelve parts by weights, and they were fed all they would clean up (this ranged from thirty-five to seventy pounds each, depending on the cow). Grain was fed in amounts depending upon the individuality of the cow. However, the cows were not fed high at any time, although at first it took more to keep them in condition than when they became acclimatized. Bran, crushed oats, peas and barley (home-grown), and crushed oats and wheat (from the prairies), were fed as the regular mixture and, for a few months before freshening, cows received from one to two pounds of oil cake meal.

The above grains have been found more profitable for milk production than a mixture of bran, shorts and oil meal, a ration of the same approximate cost, based on tests of the whole herd.

For profitable feeding of the dairy herd either roots or ensilage are essential, but both are preferable.

In June, 1912, there were purchased from J. M. Steves, of Steveston, three pure-bred cows, namely, Aurora Mechthilde (9701), four years old, Lina of Lulu 2nd (12044) three years old; and Pietze Priscilla Mechthilde (14123) 2½ years old.

These are all sired by Sir Canary Mechthilde (5318), and to date have all done good work. A heifer calf has been dropped by Aurora Mechthilde, but as yet the other two have not freshened.

The young bull, Sir Natoye Korndyke, although not a show bull, has developed into a large, vigorous animal. In November, 1912, there was purchased another young bull, Colony Sena Korndyke (14840), from the Provincial Government Farm at Mt. Coquitlam. This bull is very much the same blood line as the one we are now using, only he is several generations closer to Pontiac Korndyke, being sired by Ragapple Korndyke 7th. This youngster promises well.

The following table gives the results of all cows that have finished their first lactation period since coming to this Farm. Another year should see a big improvement in these results:—

Dairy Records.—Agassiz Farm.

Date of Calving.	Calf.	No. of Days Milked.	Grain Fed.	Silage Fed.	Total Milk.	Average Milk Daily.	Average Fat.	Total Fat.
					Lb.			Lb.
December 4, 1911....	Bull....	305	1,368	7,260	6,419·42	21·04	3·42	219·54
January 28, 1912......	" ...	290	1,120	9,020	7,678·84	26·47	4·03	309·45
April 13, 1912.........	" ...	331	1,672	13,820	8,885·37	26·87	3·97	354·74
February 26, 1912.....	" ...	325	1,538	11,590	9,396·97	28·02	3·43	322·21
March 1, 1912.... ...	"	234	836	4,650	5,145·52	22·07	3·72	191·41
February 23, 1912.....	Heifer..	343	1,253	10,480	7,317·2	21·32	4·31	315·37
January 2, 1912.......	Bull.. ..	301	1,060	6,220	7,215·9	23 97	4·01	289·35
January 21, 1912.... .	" ..	402	1,466	14,230	11,163·1	27·76	3 36	375·08
March 15, 1912..	Heifer..	302	1,404	9,830	7,123·84	23·58	3·42	243·63
April 2, 1912..........	" ..	330	1,353	19,580	7,025·84	21·28	4·33	304·20
April 4, 1912..........	Bull....	328	1,456	11,530	7,870·92	23·99	3 66	288·07
February 13, 1912.....	Heifer..	333	1,452	11,975	8,408·57	25·25	3·89	327·09
March 17, 1912... ...	Bull....	348	1,684	12,860	10,332 14	29 69	3·31	341·99
May 11, 1912....... ..	Heifer..	290	1,434	10,800	7,410·66	25·57	3·15	233·43
March 5, 1912....	" ..	301	1,244	8,125	7,220 7	23·82	3·51	253 44
May 11, 1912..........	" ..	301	1,452	14,940	6,668·69	22·12	2·99	199·39
March 27, 1912. .. .	Bull....	317	1,464	11,160	7,881·8	24 86	3 05	240·39
March 19, 1912........	Heifer..	346	1,429	11,500	8,525·95	24·64	3·42	291·58
January 26, 1912......	" ..	222	786	6,365	5,037·55	22 68	3·96	199·48
March 8, 1912	" ..	336	1,444	10,220	8,675·37	25·81	3·25	281·94
March 26, 1912.	Bull....	306	1,284	9,230	6,473·9	21·16	3·79	245·36

There are on hand nine heifers, all nearly a year old, which were born in the spring of 1912. These are of unknown breeding, except that something is now known of their dams. All are well-developed and very promising. This spring there was dropped a larger percentage of heifers, twelve of which are now on hand. This, although a little slow will be the best, safest and surest method of increasing the herd. The farm can carry a far greater number of stock than is on hand at the present time.

On page 424 of the 1912 report will be found a table of the production of the individual cows, from freshening to the date at which the report was written. Table No. 1 of the present report includes the performance given in the 1912 report and added to this is the performance of each individual cow to the end of her lactation period.

From the past year's work, it has been learned that cows shipped from the East take considerable time to become acclimatized, and if put into good condition so that they will be profitable for the coming year, probably take more food for the return given than they otherwise would.

The results given in table No. 1 are of the first lactation period of the cows in this province. For the fiscal year just ended, twenty-three cows, which are still on the Farm, have been taken, and in table No. 2 is given the cost of production of one hundred pounds of milk and also of one pound of fat when the food is valued at the following rates:—

Oil cake meal..............	$45 per ton.
Bran.............	28 "
Mixed Grains: Oats, peas, barley............................	30 "
Roots...........	3 "
Silage..............	3 "
Green feed..........	3 "
Hay............	10 "
Pasture........	3 per acre.

The cows were fresh in the spring of 1912 and went dry in winter, freshening early in January, February and March. For the months of April and May it was not possible to obtain a record of the fat, but from the first of June a sample has been taken from every milking, and accurate records kept.

In the months of November and December, a small amount of milk was obtained in proportion to the amount of feed used, thus the cost of one hundred pounds of milk and of one pound of butter fat is somewhat high. At this stage, the cows were going dry or were dry and bodily flesh was being stored. If credit were given during the succeeding months and if products of such were averaged with the month of lowest production, the cost would be much more uniform than as shown in the following table:—

Feed Cost of 100 Pounds of Milk and 1 Pound of Fat by Months.

Month.	100 pounds of Milk.	1 pound of Fat.
	$	$
April	1 20	....
May	0 48	....
June	0 33	0 10
July	0 33	0 10
August	0 63	0 17
September	0 72	0 20
October	1 20	0 32
November	1 54	0 42
December	2 10	0 54
January	1 51	0 40
February	0 98	0 37
March	1 02	0 28

Number of cows—23.
Average weight of cows—1,183·6 pounds.
Average milk per cow—7,606·68 (12 months).
Average fat per cow—204·15 (10 months).

The above figures represent a total of the entire number of cows in the herd. From the herd, ten cows were selected, five of which appeared this year to be the most profitable and five of which appeared to be the least profitable. The milk was figured at 18 cents per gallon and the fat at 50 cents per pound. The difference in the two sets of cows is shown by the amount of fat produced. There is a difference in the amount of food consumed by each of these lots, since each cow was fed as nearly as possible according to her production. If they had all been given the same amount of food the results would vary greatly and the least profitable cows would have been many times less profitable.

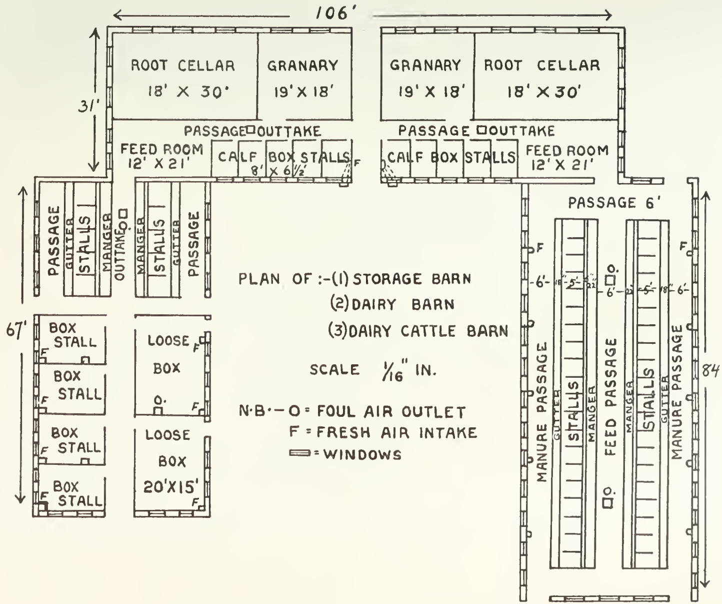
The following table will illustrate this without further comment:—

Comparative results of the five most profitable and the five least profitable cows.

—	Number of Days Milked.	Yield of Milk.	Yield of Fat.	Cost of Food and Profit over Food for 1 Cow, Average of 5 Cows.	
				Cost of Food.	Profit over Food.
		Lbs.	Lbs.	$ cts.	$ cts.
Five most profitable cows	345	9,637·2	344·2	54 27	117 83
Five least profitable cows	270	6,136·2	208·6	36 62	67 68

The Barn, Experimental Station, Lacombe, Alberta.
Beef Barn to the left, dairy Barn to the right, and calf and storage Barn in background.

Interior of Dairy Barn, Experimental Station, Lacombe, Alberta.


106'
31'
ROOT CELLAR 18' X 30'
GRANARY 19' X 18'
GRANARY 19' X 18'
ROOT CELLAR 18' X 30'
PASSAGE OUTTAKE
PASSAGE OUTTAKE
FEED ROOM 12' X 21'
CALF BOX STALLS 8' X 6½'
CALF BOX STALLS
FEED ROOM 12' X 21'
PASSAGE
GUTTER
STALLS
MANGER
OUTTAKE O
MANGER
STALLS
GUTTER
PASSAGE
67'
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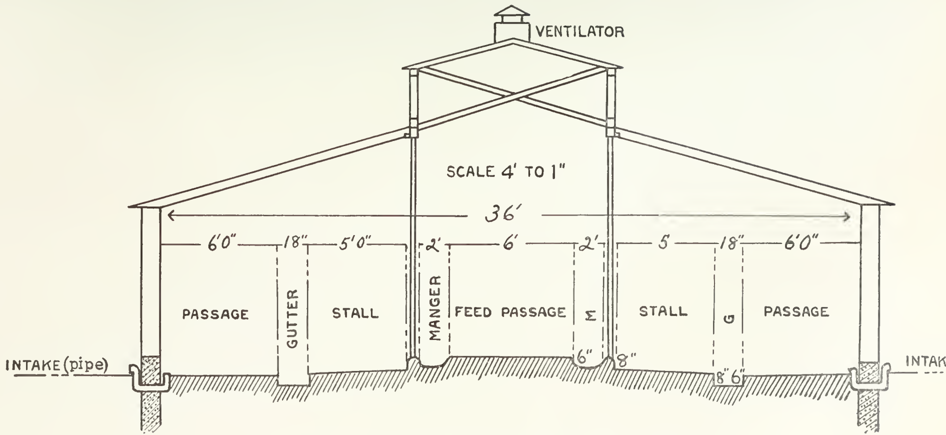
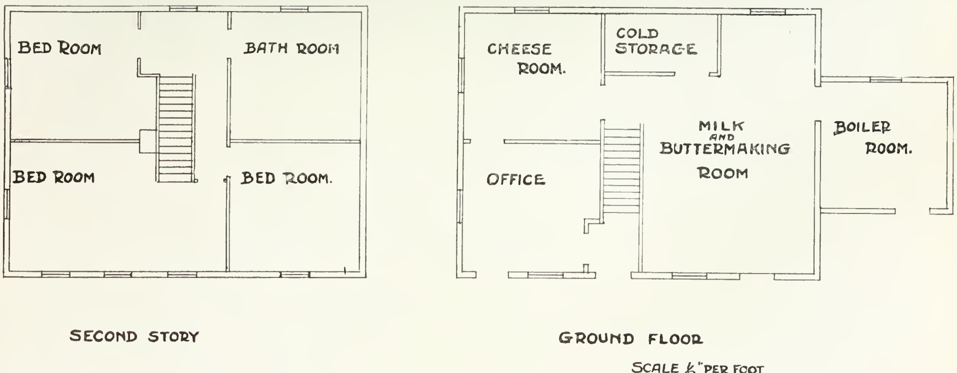
BOX STALL
BOX STALL
BOX STALL
LOOSE BOX
LOOSE BOX 20'X15'
PASSAGE 6'
MANURE PASSAGE
GUTTER
STALLS
MANGER
FEED PASSAGE
MANGER
STALLS
GUTTER
MANURE PASSAGE
84'
PLAN OF :-(1) STORAGE BARN
(2) DAIRY BARN
(3) DAIRY CATTLE BARN
SCALE 1/16" IN.
N·B·—O = FOUL AIR OUTLET
F = FRESH AIR INTAKE
= WINDOWS



Cross-Section, Dairy Stable, Experimental Station, Lacombe, Alberta.



Plan of Dairy Building, Experimental Station, Lacombe, Alberta.

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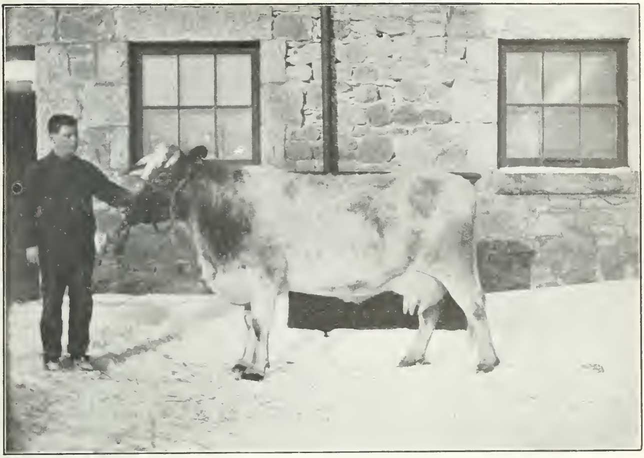
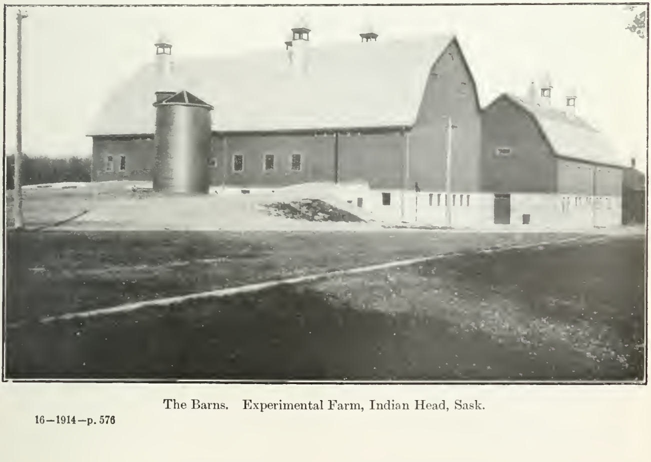


Duchess 3rd—Dual Purpose Shorthorn. Gave 1815½ lb. milk from Dec. 19th, 1912 to Jan. 18th, 1913.



The Barns. Experimental Farm, Indian Head, Sask.

Dairy Cattle at Pasture, Experimental Farm, Agassiz, B. C.

BUILDINGS.

The buildings which we erected, as reported on in our last report, have given us excellent satisfaction. As is the case with almost every one, after they are finished we can see some improvements which we would like to make but, on the whole, they are very satisfactory. The lighting is good and the ventilation thorough; the inward opening of the windows has given us perfect satisfaction in this climate.

The steel stall fittings which we installed have given excellent satisfaction, but we have discarded everything except that which was necessary to hold the cows in place. We tried the stalls with all the accessories and also stripped them to the bare stanchions and division hoops and find that when one uses the mangers the other material is superfluous and is detrimental, as a dust collector.

The system of watering from the cement feed trough in front of the cows has also proven very satisfactory, and, provided there is no contagious disease in the herd it is a cheap, sanitary and effective method of watering the cows. It has also a tendency to keep the mangers perfectly clean. The cows' stand we have been able to keep perfectly dry and warm, but unless a sufficient quantity of bedding is used the floor is somewhat hard on the cows' feet and knees.

The dairy, since our last report, has been completed and has been found to give satisfaction for a herd the size of the one which we are at present carrying. On the walls of this dairy, we made the experiment of finishing them with a good quality of white table oil-cloth and this has proven to be a cheap and efficient wall covering.

However it should not be brought down to the floor where it would be brought into constant contact with water; we have tried this and found that it had to be removed for a foot or two from the cement floor.

HORSES.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN—E. S. ARCHIBALD, B.A., B.S.A.

During past years, the horses were kept for labour purposes exclusively but, in 1912, a small start was made in breeding work.

The horses kept at present number eighteen, and are made up of: 14 heavy horses, mares and geldings of Clydesdale and Percheron blood, 3 heavy driving horses, 1 light driving horse.

The eighteen horses on the Farm are expected to do not only the labour on the 200-acre farm but, in addition, must supply necessary labour to the Horticultural, Cereal, and Botanical Divisions. In addition a large amount of hauling and cartage in connection with all the Divisions, as well as roadmaking and messenger service, take up much of their time.

Amongst the heavy draught horses, numbering 14, there are 6 pure-bred and grade Clydesdale mares. The three best mares have been bred in order to acquire data as to the cost of horse production, and the many other phases of horse breeding. A gradual extension in this work is anticipated.

Horse-breeding work has also been started on the branch Farms, and we look for much valuable and interesting information during the next few years.

HORSE LABOUR.

During the year from April 1, 1912, to March 31, 1913, the work done by the horses kept in the stables here was equivalent to 6,452 $\frac{3}{10}$ days' work, distributed as follows:—

Live stock, hauling feed, milk delivery, etc.	236 days.
Farm work (200-acre farm)	1,027·5 "
Manure on 200-acre farm	480·8 "
Horticultural Division	832 "
Cereal Division	684 "
Poultry Division	38·5 "
Bulletins to and from Farm offices	44·5 "
Lawns	115 "
Arboretum	143 "
Omnibus service and supervision of work	1,456 "
Care of woods	489·5 "
Various, including hauling freight, sidewalks, exhibitions, etc.	905·5 "

Making a total of 6,452 3/10 days which, at 70 cents per day, gives a total valuation of $4,516.61.

THE HORSE STABLES.

In view of the fact that there is an increasing number of inquiries regarding stable construction, ventilation and concrete floors and stands in the horse stable, I would, for the benefit of the readers, refer them to the annual reports for the years 1908 and 1910, of the Dominion Agriculturist.

The Rutherford system of ventilation continues to give the best and most excellent results.

The cross-lined concrete passages are perfectly safe whether dry or wet in winter or summer.

The graded, grooved, concrete stall floors still looked upon with suspicion by some horsemen, continue to prove their superiority over wood floors from the points of safety, sanitation and durability. No troubles, such as dry feet, quarter cracks, side bones, capped hocks, rheumatism and the like, so often attributed to concrete floors, have been encountered during the six years in use.

The ease in cleaning stalls and maintaining an atmosphere free from unpleasant odours strongly recommends such construction.

FEEDING THE WORK HORSES.

The feeding of the horses is conducted along the same lines as in former years. The stableman feeds all horses, and, under his supervision, each teamster is responsible for the washing and cleaning of his horses and harness.

The feeds used are mixed hay, fed long, oats and bran, generally in the proportion of 5 parts oats to 2 parts bran, mixed and fed dry. Warm bran mashes, 5 to 6 pounds per horse, are used on Saturday nights to replace the regular grain ration. When horses are on very heavy work, the proportion of bran is decreased to 1 part for 5 parts oats. These rations between bran and oats were decided best after much experimental work. Readers interested are referred to the annual reports of the Dominion Agriculturist, years 1904 and 1905.

A safe standard for feeding draught horses, and one commonly used here is that of giving from 1 to 1¼ pounds of the above grain mixture and one pound of hay for each 100 pounds live weight; this, of course, subject to variation depending on the severity of work, condition of animal when fed, the health of animal, and other minor considerations.

The morning feed, about 5 a.m., consists of about three-eighths of the total grain mixture and one-quarter of the hay for that day. The noon ration is the same. The evening feed consists of one-quarter of the grain and about one-half the hay for the day.

Water is supplied after the morning feed and before the noon and evening feeds. During the winter, water is also supplied in the evenings, some three hours after the feed.

With the above treatment, the horses are maintained in good working condition, and with an almost entire absence of common stomach and intestinal ailments such as indigestion and colic. No condiments are used, but to horses somewhat low in flesh and requiring more feed, molasses mixed with the grain is used in small quantities as it stimulates the appetite by increasing the palatibility of the food.

Experimental work as to the food value of molasses, and similar lines of work are anticipated.

FINANCIAL STATEMENT.

Returns.

To 6,452⁹⁄₁₀ days labour at 70 cents	$ 4,516 61	
To 150 tons manure at $1.00	150 00	
		$ 4,666 61

Expenditures.

By cost of feed	$ 2,205 00	
By shoeing of horses	125 00	
By stableman	658 00	
By harness and repairs	113 35	
		3,101,35
Balance for horses		$ 1,565 26

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT—J. A. CLARK, B.S.A.

The horses were kept for labour purposes. One carriage horse was purchased during the year. A draught horse and colt were sold in anticipation of buying a team of mares for breeding purposes. At present they are four in number, as follows: 1 heavy draught horse, 1 heavy draught mare, 1 express horse and 1 carriage horse.

The horses were fed during heavy work about 13 pounds oats and bran, mixed 1 part bran to 8 parts oats, and 20 pounds hay per day per 1,000 pounds live weight; and during light work about 9½ pounds oats and bran, mixed 1 part bran to 3½ parts oats, and 28 pounds of hay per day. Carrots were fed as required. They have been healthy and were always ready for any work required of them.

HORSE LABOUR.

During the year the work done by the horses was equivalent to 457 days' work, distributed as follows: Live Stock, hauling building material, etc., 85·6 days' work; Field Husbandry Division, 183 days' work; Horticultural Division, 28·6 days' work; Cereal Division, 7·5 days' work; Messenger service, exhibitions, hauling freight and express, etc., 16·4; one horse, general driving, supervision of work, etc., 136 days' work.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT—R. ROBERTSON.

Nine horses are kept on the Farm. Six of them are draught and three for light purposes. All are in good condition.

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT—GUS. A. LANGELIER.

HORSES.

There are now at the Station eight pure-bred French Canadian mares, also a two-year-old and a weanling filly of the same breed, besides two grade teams of from 2,600 to 2,900 pounds weight per team, and a driver of about 1,000 pounds. Four of the pure-bred mares are in foal to a stallion of the same breed.

The following table gives some idea of the total number of horses necessary for this farm and the number required for farm labour:—

—	Total Number.	Number available for work.
Least number reqiured to do farm work, on the basis of ten hard working hours practically every day from May 1 to November 1	....	12
1 stallion	1	
16 mares	16	
Out of these 16 mares, only half will be bred each year, leaving 8 for hard work	....	8
The other 8 in-foal mares, one three-year-old and the stallion to average four hours of hard work or eight hours of easy work	....	4
The 8 mares bred each year, to produce five living foals, out of which a weanling would be sold each year, leaving	4	
And a yearling to be also sold each year, leaving	3	
Also a two-year-old to be sold each year, leaving	2	
And a three-year-old or a mare to be also disposed of each year leaving	1	
	27	12

It may seem exaggerated to put down 8 in-foal mares, 1 three-year-old stallion or filly, and an aged stallion, as only doing the work of four horses, but when 12 horses, or 6 teams, are required to do the work, it is meant that 6 heavy teams are needed. Though the French Canadian horse is a splendid animal, full of grit and endurance, the weight is not there, and grit cannot supplement weight for a very long time on heavy machines, which are required to work steadily 10 hours per day at their full capacity. By full capacity is meant that the lever on a disc harrow is to be at the last notch, the manure spreader filled, loads of hay, grain, silage, roots are not to be half loads; also that land requiring to be ploughed six inches is not ploughed four, that the team is not to stop and rest every half hour on the grain or corn binder. In fact, work and not half work is wanted, and to do good, steady, heavy work, ten hours every day (and sometimes 12 and 13 in the rush of the season), in-foal mares, colts and stallions, of a light breed, on an average, will not do more than is credited them in the above list.

Moreover, it should be understood that to do work with light horses throughout, and with in-foal mares, colts and stallions in particular, causes a waste of manual labour and is a costly proposition. An in-foal mare, for instance, that works ten hours a day ploughing four inches deep in light land, cannot stand more than five

hours on the big cut-away disc. Nor should she get these five hours all in a stretch, but half in the morning and half in the afternoon. This means that another has to be hitched and brought to the field to replace her, whilst she is taken to the barn. To do good work at making straight drills, or working the disc seeder the shortest way across the field, two quiet horses are needed and should be used nearly all the time by the same man. If two in-foal mares cannot stand ten hours a day of this, then two mares not in foal must be used, which takes them away from harder work where 4 or even 5 in-foal mares might have to be used to replace them.

Even if the farmers of Quebec, during the next 25 years, find that the ever-increasing wages of hired men compel them to use heavy horses, the work which will be done here with the French Canadian will not be lost, as we will be breeding horses about 200 pounds heavier than the common run of mares of this province, and by disseminating this blood, the breeding stock will be increased in size and better prepared to be advantageously topped with draught stallions than it now is.

FEED AND CARE OF BROOD MARES.

Timothy, clover, swedes, oats and bran were used. For details, I beg to give copy of the written instructions given to the horseman at the beginning of winter:—

'*Morning.*—4 pounds timothy, 4 pounds clover.

'*Noon.*—5 pounds oats, 1¼ pounds bran.

'*Night.*—(When the mares have worked more than five hours), 6 pounds timothy, 3 pounds clover, 5 pounds oats, 1¼ pounds bran, 6 pounds swedes.

'When the mares have worked less than five hours, 9 pounds clover, 6 pounds swedes.

'N.B.—If there is constipation, cut down the oats and increase bran and swedes; if bowels are too loose, increase oats and cut down bran and swedes.'

The mares were weighed every two weeks and when, in a very few cases, it was found that they had lost weight, they were kept during the next fortnight on the ration 'when the mares have worked more than five hours,' even if they worked less. At the same time, lighter work was given them, and every time, without a single exception, they regained the lost weight and more during this period.

There were two reasons for feeding only hay in the morning; the first was to give the mares more time to eat this roughage, as they received only grain at noon, having just one hour for their noon meal. Besides, if grain and meal had been fed in the morning, the horseman, not knowing at noon which of the mares were to work in the afternoon, would not have known if he again should feed grain or not.

A rigid rule was made that the in-foal mares had to go out of the stable every day except Sunday. When there was no work to do which was suitable for them, they were hitched on a sleigh and driven for at least half an hour. They had to get exercise and they got it, rain or shine. They were never asked to draw very heavy loads, nor to back even a small load, and they worked reasonably, without either doing too much or being coddled. It will be disappointing if they do not drop strong colts, though the raising four healthy colts from four in-foal mares is not anticipated.

RAISING COLTS.

The weanling filly weighed exactly 755 pounds the day she was one year old. Her dam's weight is between 1,100 to 1,150 pounds. There seems no doubt that this filly will weigh over 1,250 pounds at maturity. She is as big as most yearlings which the writer has seen when visiting over twenty stables to buy French Canadian

mares. However, she did not make this growth on nothing, but because she received lots of good clover hay, and lots of oats and bran. There is not much 'secret' about these feeds. The only 'secret' about the farmers not getting size in their horses is 'not enough feed.' No colt has ever been ruined by giving too much of the above named feeds, when it gets lots of exercise. This is why the filly was turned out every day of the winter (except three or four very stormy ones) from about 8 in the morning until 5 in the afternoon in a paddock where there was from one to three feet of snow. There was a well-bedded shed, boarded on three sides, where she could go in when it was blowing hard. But it is wonderful how little she made use of it. Of course, if the filly had been fed as heavily as she was, and had remained in a box stall all winter, there are ten chances to one that her limbs could not have retained their good quality and condition.

EXPERIMENT—WINTERING A HORSE AT LOW COST.

The gelding which was used for this experiment in 1911-12 was in splendid shape for last season's work. There seems no doubt that the bulky ration and the roots had a very beneficial effect on the digestive tract of the animal.

The same experiment was made in 1912-13. A very nervous mare, about 15 years old, was used. She was chosen to see how a nervous animal would come through, the gelding of the previous year being of a rather quiet disposition. She gained 105 pounds weight between November 1 and March 31.

The ration fed both years was one pound of hay from mixed grasses, one pound of straw, and one pound of swedes per day per 100 pounds weight of the animal.

If the mare used in the experiment of 1912-13 goes through the season's work in good shape, it would seem advisable for farmers who own more horses than they can use in winter time, to try this way of feeding the idle animals.

This experiment should, in my opinion, be continued for a couple of years more, when a short bulletin or leaflet might be published.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT—W. C. McKILLICAN, B.S.A.

HORSES.

The horses on this Farm at present consist of the following: 12 heavy horses of grade Clydesdale and Percheron breeding, 2 light horses for driving, 1 heavy colt, grade Clydesdale.

The horses are kept for labour purposes almost exclusively, only one colt having been raised during the year.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT—G. H. HUTTON, B.S.A.

HORSES.

In order to secure power to handle the increased area of three hundred and eighty acres acquired by the Station in March of 1912, ten mares were purchased during the year. Pure-bred Clydesdale and Percheron mares are represented in the purchase, as well as grades of both breeds. A number of these mares were in foal at the time of purchase. 'Navel Ill' or 'Joint Ill' was responsible for a heavy mortality in the foals, only one of five being raised. Even foals born on pasture and treated immediately with disinfectants, were not immune.

The general health of the horses, which now number seventeen head, has been good throughout the year. All the horses, except those necessary for winter work, were wintered outside on the straw stacks, and have come through the winter in prime condition.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT—P. H. MOORE, B.S.A.

HORSES.

The horses on the Farm have been kept for working purposes only, no experimental work of any sort having been done with them, and the force numbers the same as last year. The four new ones purchased late last year have improved in usefulness as they became more acclimatized to the country.

Three of the older ones which have been on the Farm for many years are on the down grade and not as useful this year as they have been in the past; in the near future they will have to be replaced by younger and better individuals. Last winter being only moderately cold and the weather steady, a great deal of work was done with the teams, and at the time of writing they are in excellent working condition, although not fat.

SHEEP.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN—E. S. ARCHIBALD, B.A., B.S.A.

BREEDING SHEEP.

There are now 57 pure-bred sheep in the pens. Two breeds only are kept, namely, Shropshires and Leicesters.

The Shropshires include 1 ram, 13 aged ewes, 3 shearling ewes, 8 spring ewe lambs and 9 spring ram lambs.

The Leicesters include 9 aged ewes, 2 shearling ewes, 8 spring ewe lambs, and 4 spring ram lambs.

Only a fairly successful year can be reported so far as breeding operations with sheep are concerned.

The crop of lambs in the spring of 1912 was good (132 per cent), and until midsummer both ewes and lambs did particularly well. Limited as they were to the small area of two acres of pasture, this restriction proved their undoing. Although the six acres in the sheep rotation is in a three-year rotation and the sheep remain only one year on each field, yet it is so soon cropped close that intestinal parasites spread and multiply very rapidly.

The ewes and lambs, as in former years, became infested with both tape worms and stomach worms, and though treated promptly, they did not recover from the effects of the parasites until transferred to the less limited and the clean aftergrass pasture of the larger rotations on the Farm.

The treatment given for tapeworms, with such good results, was as follows:—

Fast the animals for at least 24 hours. Drench mature sheep and shearlings with a mixture of 4 ounces of castor oil and 1 dram (⅛ ounce) of ethereal extract of Male Fern. Lambs may have one-quarter to three-quarters of the above dose, depending on size and age. Confine sheep for 24 hours after drenching. Destroy worms given off in manure.

Follow the above drench with a laxative tonic such as: Common salt, 2 pounds; potassium nitrate, 4 ounces; Epsom salts, 1 pound; iron sulphate, 8 ounces; powdered gentian, 8 ounces. This mixture is sufficient for 100 mature sheep or 150 to 200 lambs, and also is best given in water solution as a drench.

Only one lamb was lost during, or as a result of, the whole treatment. By a post mortem it was discovered that the intestines had actually become congested with clots of worms which was the immediate cause of death.

Apparently very favourable results were obtained in the eradication of stomach worms by the use of a 1 per cent solution of coal tar creosote. Lambs were given 2 to 4 ounces, and mature sheep 3 to 5 ounces, varying with the size. This was administered as a drench, was preceded by a 24-hour fast, and succeeded by a 24-hour confinement and the laxative tonic as above.

Owing to limited accommodation, no lamb-feeding experimental work was undertaken on the Central Farm during the past year. With the erection of a lamb-feeding shed, anticipated, this work will be continued and extended.

FINANCIAL STATEMENT.

Below are submitted inventories and returns for the sheep on the Central Experimental Farm during the year April 1, 1912, to March 31, 1913:—

	April 1, 1912.		April 1, 1913.		Returns.	Gross returns made up of increase in value of products and value of animals sold.
	No.	Value.	No.	Value.	Value.	
Sheep all breeds and ages..	59	$ 845.00	57	$1,028 00	$ 299.50	$ 482.50

RETURNS.

Returns made up of increased value and sales	$ 482.50	
Manure, 50 tons at $1 per ton	50.00	
		$ 532.50

EXPENDITURES.

Feed consumed	$ 426.33	
Total labour expended	75.00	
		$ 501.33
Net balance from sheep		$ 31.17

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT—J. A. CLARK, B.S.A.

BREEDING SHEEP.

As this farm is small and allows for no pasturage, it is impossible to maintain a breeding flock. Nevertheless there are many problems in lamb breeding which demand immediate attention, and these are being investigated as time permits.

EXPERIMENT IN FATTENING LAMBS.

To determine the relative value of roughage for fattening lambs, a second experiment, similar in outline to the one conducted in 1912, has been carried on. Owing to increased facilities for housing and feeding, additional pens were added there being in all six lots of 12 lambs each and one lot of 11 lambs, a total of 83 lambs.

Wether and ewe lambs, as near uniform in weight as possible, were selected. They were medium-sized lambs, the average weight being 74·5 pounds. These lambs were purchased in Prince county, and represented grades of many breeds.

The lambs were allowed to run on rape and pasture for a short time previous to being put on feed.

After this preparatory period they were fed as follows:—Each lot received 2 pounds 8 ounces per diem at starting, and an increase of 8 ounces of a meal mixture per diem throughout the experiment. The meal mixture was made up as follows:—100 pounds oats, 100 pounds barley, 100 pounds peas and 300 pounds bran. The roughage fed the different lots was as follows: Lot I received alfalfa hay until January 14, when, owing to the supply of first quality alfalfa hay giving out, a second quality, containing about 30 per cent couch grass, was supplemented with 3 pounds of bran per diem per pen. Notwithstanding the addition of bran, this pen fell off in gains from that time.

Lot II was fed as much mixed hay (60 per cent timothy) and corn stover as they would eat. They began with equal parts of hay and stover. The stover was increased the first of January to 55 per cent of the roughage and continued so until the end of the experiment.

Lot III was fed what timothy hay and mangels they would eat.

Lot IV was fed oats and pea hay and what turnips they would eat.

Lot V was fed alfalfa hay and turnips. These lambs did not make nearly as good gains as lot I for the first two months, but later they came out ahead, when both lots were fed the poorer quality of alfalfa hay.

Lot VI was fed mixed hay (60 per cent timothy) and garden refuse (waste cabbage, tops of vegetables, etc.).

Lot VII was fed timothy hay and oats and pea hay mixed together.

The lambs were badly infested with ticks and lice. The ticks were destroyed in two dippings, but the lice continued to annoy the lambs throughout the period, the creolin dip having little effect upon these merciless vermin.

In calculating the cost of feeding, the following prices were charged:—

Roots, ensilage and garden refuse	$2 00 per ton.
Hay	7.00 "
Meal mixture	25.00 "

LAMB FEEDING EXPERIMENT.

(Alfalfa hay vs. mixed hay, and corn stover vs. timothy hay, and roots vs. oat and pea hay, and roots vs. alfalfa hay, and roots vs mixed hay, and garden refuse vs. timothy hay and oat and pea hay, as roughage in fattening lambs.)

Lot.		I.	II.	III.	IV.	V.	VI.	VII.
Class of Feed for Lot.		Alfalfa.	Mixed Hay and Corn Stover.	Timothy and Mangels.	Oat and Pea Hay and Turnips.	Alfalfa and Turnips.	Timothy and Refuse.	Timothy, Oat and Pea Hay.
Number of lambs in lot		12	12	12	12	12	12	11
Number of days in experiment		88	88	88	88	88	88	88
Total weight at beginning	Lb.	883½	884	883½	8 84	884	884	883½
Total weight at end	"	991	907	964	960	1005	957	940
Gain during period	"	107½	23	80½	76	121	73	56½
Gain per head	"	8·96	1·91	6·7	6·3	10 08	6·08	5·13
Gain per head per day	"	·102	.022	·076	·072	·114	·07	·06
Quantity of meal eaten by lot during period	"	714	602½	602½	602½	603½	602¼	580·5
Quantity of alfalfa hay eaten by lot during period	"	2137	....	....	....	1760	...	....
Quantity of timothy hay eaten by lot during period	"	....	....	1325	....	....	....	1269
Quantity of mixed hay eaten by lot during period	"	....	1380	....	1953	....	1274	848
Quantity of roots and ensilage eaten by lot during period	"	...	1632	1470	1419	1357	1820	....
Total cost of feed	$	16 40	13 99	13 63	15 77	15 05	13 80	14 67
Cost of feed per head	"	1.37	1.17	1.13	1.31	1.25	1.15	1.33
Cost of feed per head per day	cts.	1·55	1·32	1·29	1·49	1·42	1·31	1·5
Cost to produce one pound gain	"	15·25	60·8	16·4	20	12·4	18·9	26
Original cost of lambs at 4½ cents per pound live weight	$	39·76	39·78	39·76	39 78	39·78	39·78	39·76
Original cost of lambs, plus cost of feed	"	56·16	33·77	53·39	55 55	53·85	53·58	54·43
Selling price at 6¼ cent. per pound	"	61·94	56·69	60·25	60·00	62·81	59·81	58·75
Net profit on lot	"	5·78	2·92	6·86	4 45	9·46	6·23	4·32
Net profit on lamb	cts.	48	24.3	57·2	37·1	79·	52·	39·2

LAMB FATTENING EXPERIMENT.

(Average results of two years' tests of alfalfa hay vs. mixed hay, and corn stover vs. timothy hay and roots as roughage in fattening lambs.)

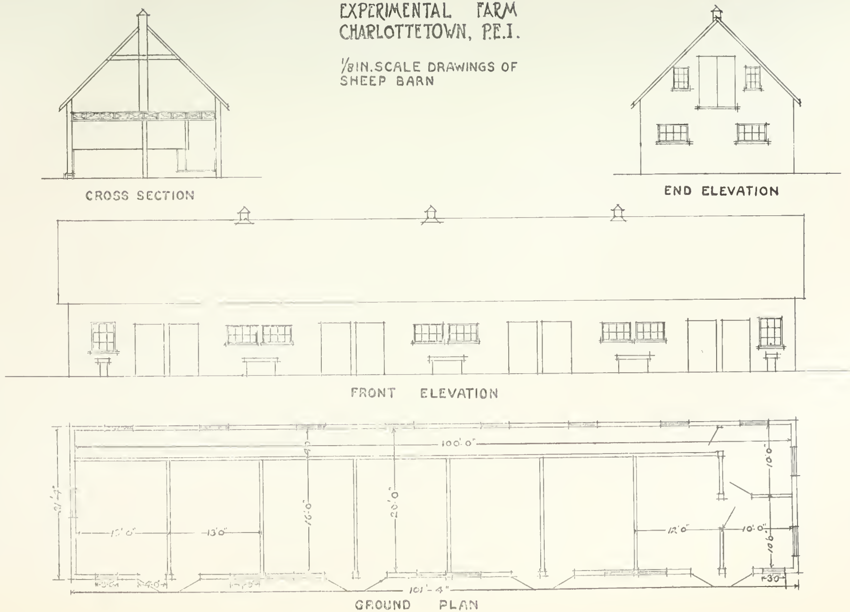
Class of feed.		Lot I. Alfalfa hay.	Lot II. Mixed hay and corn stover.	Lot III. Timothy hay and roots.
Number of lambs in group		22	22	22
Average number of days in experiment		89	89	89
Total weight at beginning of experiment	lb.	1.741¾	1,734¾	1,673
Total weight at end of experiment	"	2,010½	1,836¼	1,833¾
Gain during period	"	268¼	101½	160¾
Gain per head	"	12·2	4·6	7·76
Gain per head per day	"	·137	·052	·087
Quantity of grain eaten by lot in period	"	1,311	1,188½	1,082½
Quantity of alfalfa	"	4,819	....	....
Quantity of timothy	"	....	....	2,817
Quantity of mixed hay	"	....	2,764	....
Quantity of roots and ensilage	"	....	3,123	3,306½
Total cost of feed	$	33 25	27 64	26 70
Cost of feed per head	$	1 51	1 25	1 21
Cost of feed per head per day	cts.	1·7	1·4	1 36
Original cost of lambs	$	78 38	78 15	75 28
Original cost of lambs plus cost of feed	$	111 63	105 79	101 99
Selling price	$	123 10	112 44	103 74
Net profit on lot	$	11 47	6 65	1 75
Net profit on lamb	$	52	30·2	08
Cost to produce a pound of gain	cts.	12½	27.2	16·6

Breeding flocks grazing on Roadside, Central Experimental Farm, Ottawa.

Sheep Barn, Charlottetown. Built in 1913.

EXPERIMENTAL FARM CHARLOTTETOWN, P.E.I.

1/8 IN. SCALE DRAWINGS OF SHEEP BARN



LAMB FEEDING EXPERIMENTS.—TABLE OF WEIGHTS AND GAINS.

Tag Number.	First Weight.	Last Weight.	Total Gain.	Dressed Weight.	Percent of dressed meat.
	Lb.	Lb.	Lb.	Lb.	
Pen No. 1—No. 1......	67	84	17	40	47·6
" " 6......	80	78	* 2	38	47·5
" " 4.....	70	81	11	37	45·7
" " 3.....	77·5	93	15·5	45	48·4
" " 8......	79	87	8	39	44·8
" " 79......	57	68	11	28	41·17
" " 11......	79	84	5	38	45·2
" " 7.	74	84	10	39	46·4
" " 2......	74	87	13	39	44·8
" " 9 .. .	70	69	* 1	33	47
" " 5......	75	89	14	41	46·07
" " 13 . ..	81	87	6	42	48·3
Total...............	883·5	991	107·5	459	
Pen No. 2—No. 48.....	74	67	* 7	32	47·7
" " 17	71	70	* 1	32	45·7
" " 19	68	80	12	37	46·2
" " 24.....	65	68	3	30	44·1
" " 23 ...	78	83	5	40	48·2
" " 25......	77	76	* 1	36	47·3
" " 22.. ...	73·5	79	5·50	35	44·3
" " 16......	71·5	70	*1·5	37	52·8
" " 14......	72	72	....	36	50
" " 20.....	89	85	5·	40	47
" " 85.. ..	74	65	* 9	32	49·2
" " 15......	80	92	12	46	50
Total...............	884	907	23	433	
Pen No. 3—No. 29......	68	74	6	34	46
" " 32......	73	85	12	37	43·5
" " 34......	72	74	2	34	46
" " 77......	59	74	15	30	40·5
" " 36......	79·5	87	7·5	45	51·7
" " 35......	78	65	*13	29	44·6
" " 33......	63	71	8	34	48
" " 30......	77·5	103	25·5	52	50·5
" " 27......	82	80	* 2	39	48·7
" " 28......	75	86	11	42	48·8
" " 39......	78·5	79	·5	39	49·3
" " 86......	78	86	8	40	46·5
Total........... ...	883½	964	80·5	455	
Pen No. 4—No. 12.... .	97·5	112	14·5	58	51·8
" " 82.. ...	68	65	* 3	28	43·08
" " 26.....	73·5	75	1·5	38	50 7
" " 43......	65	74	9	37	50
" " 47	82	75	* 7	36	48
" " 49......	57	52	* 5	21	40·4
" " 10......	86·5	98	11·5	50	51
" " 46.....	60	63	3	26	41·1
" " 44......	67	79	12	38	48·1
" " 45......	82	98	16	43	44
" " 42......	79 5	92	12·5	42	45·6
" " 38	66	77	11	34	44·1
Total...............	884	960	76	451	
Pen No. 5—No. 55......	72	91	19	42	46·2
" " 51.... ..	75	91	16	45	49·4
" " 53......	82	86	4	44	51·1
" " 89.. ..	82	87	5	39	44·8
" " 52......	82	84	2	33	45·2
" " 50......	65	77	12	37	48
" " 63......	69	82	13	39	47·5
" " 59......	73·5	89	15·5	44	49·4
" " 60......	66	89	23	39	43 8

LAMB FEEDING EXPERIMENTS.—TABLE OF WEIGHTS AND GAINS—*Continued.*

Tag Number.	First Weight	Last Weight	Total Gain.	Dressed Weight.	Percent of Dressed Meat
	Lb.	Lb.	Lb.	Lb.	
Pen No. 5. *Con.*					
" " 65.. ..	78	87	9	42	48·3
" " 90.....	64·5	63	* 1·5	33	52·4
" " 57.. ..	75	79	4	31	40
Total.......... ...	884	1005	121	473	
Pen No. 6—No. 67......	65	67	2	31	46·3
" " 78......	62	78	12	35	44·8
" " 68......	69	77	8	36	46·7
" " 70......	91·5	96	4·5	44	45·8
" " 75......	87	95	8	46	48·4
" " 37......	80	74	6	34	46
" " 74	74	88	14	46	52·3
" " 55......	87	94	7	43	45·7
" " 73......	67	71	4	34	47·9
" " 76......	67	73	6	33	45·2
" " 72......	68·5	74	5·5	34	46
" " 71......	66	70	4	35	50
Total.	884	957	73	451	
Pen No. 7—No. 83.....	75	85	1	37	43·5
" " 84......	89	90	1	39	43·3
" " 64......	85	94	9	44	46·8
" " 62......	84	77·5	* 6·5	33	42·6
" " 31......	92	103	11	52	50·4
" " 80......	69·5	73	3·5	31	42·4
" " 87.. ...	82·5	82	* ·5	40	48·8
" " 21......	85	92	7	42	45·7
" " 81.....	66	70	4	34	48·5
" " 66......	83	96	13	44	45·8
" " 88......	72	78	6	35	44·8
Total.....	883	940·5	57·5	431	

*Loss.

The last weight was taken after lambs had been pastured.

Deductions.—In a comparison of the results for 1913 with that of an average of the years 1912 and 1913, there is illustrated the possible error from drawing conclusions from a single year's experimental work. However, both of the foregoing tables contain valuable and interesting data which might be briefly summarized as follows:—

1. Alfalfa is a most economical feed for fattening lambs but is often excelled by mixtures of other less concentrated roughages which have the greater succulence.
2. Alfalfa and roots makes by far the most concentrated, best balanced and most profitable roughage for lamb feeding.
3. Timothy hay alone is a poor roughage for sheep, but when fed in conjunction with roots, or garden refuse, answers fairly well, and yields fair profits.
4. Corn stover is too coarse for lambs, but, when fed with roots, yields a small margin of profit.
5. Oat and pea hay did not rank as high as anticipated, but yielded a fair margin of profit.
6. The cost per pound gain was very high in all lots excepting where alfalfa was fed.
7. The great advantage of winter feeding lambs is to hold the same over until early spring when the market is good, at the same time marketing the farm grown roughage and grain at market values, making a profit over and above the food values and retaining a large amount of most valuable manure on the farm.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT—R. ROBERTSON.

BREEDING FLOCKS.

The breeding sheep on this Farm represent two classes of sheep, namely, the long and medium-wooled breeds. Two small flocks are maintained, namely, Leicesters (6 head) and Shropshires (9 head). Owing to lack of pasture, these flocks cannot be greatly enlarged until more land is purchased or different arrangement of present fields is made.

EXPERIMENT IN FATTENING LAMBS.

To determine the relative value of timothy and clover hay as a feed for fattening sheep, an experiment was conducted this past year.

Grade wethers of mixed breeding were used for this test. They were divided into four lots of ten each, lot I being fed timothy hay, roots and meal; lot II, timothy hay and meal; lot III, clover hay, roots and meal; lot IV, clover hay and meal.

The hay and meal ration was uniform throughout as to weight, lots I and III only being fed roots. Each lamb of each lot received ½ pound meal per day at the beginning of test, the meal ration being gradually increased until, at the end of the test, each one was getting 1½ pounds of meal mixture (bran, oats, cotton seed or oil cake, equal parts).

The roughage ration fed to lots I and III was turnips, beginning with 2½ pounds per lamb per day, and increasing to 4 pounds per lamb per day at the finish, and of hay each lamb received a uniform ration of 1½ pounds per day.

For each lot the following valuations were used namely, hay, \$8; grain mixture, \$30; and roots, \$2 per ton.

The following table shows results of this experiment:—

Kind of Feed.	Lot I. Timothy Hay Roots and Meal.	Lot II. Timothy Hay and Meal.	Lot III. Clover Hay Roots and Meal.	Lot IV. Clover Hay and Meal.
Number of lambs in lot	10	10	10	10
Number of days in experiment	76	76	76	76
Total weight at beginning of experiment lb.	722	715	720	720
Total weight at finish of experiment "	957	907	955	928
Gain during period "	235	192	238	208
Gain per head "	23·5	19·2	23·8	20·8
Gain per head per day "	·30	·25	·31	·27
Quantity of hay consumed "	1,140	1,140	1,140	1,140
Quantity of meal consumed "	930	930	930	930
Quantity of roots consumed "	2,800	–	2,800	–
Total cost of feed \$	21 31	18 52	21 31	18 52
Cost of feed per head "	2 13	1 85	2 13	1 85
Cost of feed per head per day cts.	2·81	2·43	2·81	2·43
Cost of 1 pound gain "	9·06	9·64	8·95	8·90
Original cost of sheep \$	36 10	35 75	36 00	36 00
Original cost of sheet plus cost of feed "	57 41	54 27	57 31	54 52
Selling price at \$7.50 per 100 pounds "	71 78	68 03	71 63	69 60
Net profit on lot "	14 37	13 76	14 32	15 08
Net profit per lamb "	1 43	1 37	1 43	1 50

Deductions.—No deductions can be drawn from a single year's experiment, and as this work is to be repeated during the coming year it would be unwise to lay too much stress on the above. There are, however, a few points which would demand interest, namely:—

1. As might be expected, clover hay surpasses timothy hay in economy of gains produced.

2. As a rule roots add to the economy of production. This applied particularly to the timothy hay ration, but future experiments will give more conclusive evidence on this point.

3. Good profits, over and above the market value of food stuffs, may be made by winter feeding lambs in Nova Scotia.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT—W. C. McKILLICAN, B.S.A.

The flock of sheep on the Farm on March 31, 1913 consists of the following:—

Oxford Down: 1 ram, 2 breeding ewes, 1 yearling ewe;

Grade: 27 breeding ewes, 22 yearling ewes, 2 young lambs and 80 wethers.

The season has been a successful one with the breeding flock. Thirty ewes gave birth to forty-two lambs, thirty-eight of which were successfully raised. The only obstacle to success with sheep has been predatory dogs. Although the fence around the sheep pasture is supposed to be coyote-proof, dogs got in one day in July, probably through a gate not fitting tightly, killed two lambs and one ewe and worried some of the others.

FEEDING EXPERIMENT.

One hundred range lambs were bought in November, 1912, for the purpose of conducting a feeding experiment during the winter; thirteen wether lambs from our own flock were added. These were divided into three lots. One lot was fed hay of wild grasses and red top, one lot was fed alfalfa hay and the third lot was fed straw. Unfortunately the experiment was spoiled by dogs. On the night of January 28 two dogs broke into the enclosure where these sheep were kept and attacked the sheep so viciously that two were killed, twenty-two were injured so badly as to necessitate immediate slaughter, and nine more, not apparently so badly injured, died in the next few days, making a total death list of thirty-three. The remaining sheep were so badly frightened, and so many of them were suffering from injuries, that it took about six weeks before they were doing well again. The experiment was continued, and the remaining sheep, in each lot, are still getting the same feed, at the end of the fiscal year. But the results will scarcely be of any value, as the three lots did not suffer equally, and all were thrown off their feed for weeks.

Dogs are certainly the greatest obstacle to sheep raising in Western Canada. Such an experience as above described is sufficient to discourage even the most enthusiastic sheep owner. It would appear as though the country would have to choose between the dog and the sheep. Up to the present the dog has been the choice, and it seems an unfortunate one, as ninety-five per cent of the dogs in this country are wholly useless, while the sheep is invariably a useful and productive member of the farm-yard community.

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT—W. H. FAIRFIELD, M.S.

SHEEP FEEDING EXPERIMENT.

The investigations in connection with feeding sheep on alfalfa hay began last year with lambs, and was continued this winter. Unfortunately, the limited number of range lambs offered for sale in the autumn of 1912, together with the keen demand that existed for all kinds of live stock for feeding purposes, made the purchase of suitable lambs at a reasonable price extremely difficult.

In lieu of lambs, 250 head of yearling wethers were purchased. These were divided into five lots of 50 each, and were given the same combinations of feed as were used in the feeding experiment carried on during the winter of 1911-12. In addition to these 250 yearlings, we were able to get 50 lambs, which were fed on the same kinds of feed as were one of the lots, group II of yearlings.

PURCHASE AND DESCRIPTION OF SHEEP.

On November 26, 250 yearling wethers and 50 lambs were purchased from H. A. Suggitt, of Coaldale, Alberta. The yearlings were small, medium smooth, Merino grade wethers, quite fine in the bone. These were taken out of a bunch of Montana range sheep that Mr. Suggitt had recently purchased. The lambs, obtained from the same party, were good grades, showing a little stronger infusion of the mutton breeds on the Merino foundation than is usual with range sheep in this district.

The 250 yearlings cost \$3.75 per head, and the lambs 5¼ cents per pound.

TROUBLE WITH DOGS.

The experiment was begun on November 30. The yearlings were divided into five groups of 50 each. Considerable care was taken to see that the division was made evenly and that the lots were about equal in quality and weight. Group I consisted of the 50 lambs and groups II, III, IV, V and VI were yearlings. Four days after feeding began, or on the morning of December 3, dogs got into the pens and injured a large number by chasing and biting them on different parts of the body. None of the lots were spared, but they did the most damage to group V, where they killed five outright and injured twenty-five more or less severely. Twenty-eight more yearlings were purchased from Mr. Suggitt to replace those killed and seriously injured.

Although careful watch was kept, the pens were again visited by dogs on the early morning of December 21. This time fewer sheep were killed outright, but the dogs worried all the groups. Many were severely bitten, and it was several days before the lame ones all recovered.

The kind of fencing used for the corrals was an ordinary eight strand woven wire fence, 46 inches high. It is evident that this is not sufficient to protect sheep from the attack of dogs. After the second visitation, the openings in front of each shed were boarded up with 1 by 4 boards with a 3½-inch space left between each board.

The sheep thereafter were enclosed in the sheds at night, where they were safe from dogs.

As loss from dogs is something that can be prevented by enclosing the feeding lots with a dog-proof fence, we shall, in reporting this experiment, consider only the number of sheep remaining in each group after the last visit from the dogs. The gains made during the first month will, of course, be considerably smaller than would have been the case had the trouble not occurred, for a good many were lamed and injured generally.

GENERAL OUTLINES.

The primal object of the experiment was to obtain data regarding the possibility of marketing alfalfa hay profitably through the feeding of range sheep.

The plan followed was similar to the feeding test carried out last winter, except that yearling wethers were used instead of lambs in the five groups. One group of lambs was added and was fed the same as one of the groups of yearlings, *i.e.,* alfalfa, meal and roots.

The yards are 100 by 25 feet, with a shed 12 by 25 at one end; this has an opening 6 feet wide in front, and it was this opening that had to be partially closed with 1 by 4 boards, placed 3 to 4 inches apart. At night the sheep were enclosed in these sheds on account of the danger from dogs mentioned above. The sheep would probably have been better off with a greater circulation of air than this allowed.

The different lots were fed as follows:—

Group I.—Alfalfa, mixed grains and roots (lambs).

Group II.—Alfalfa, mixed grains and roots (yearlings).

Group III.—Alfalfa and mixed grain (yearlings).

Group IV. Alfalfa and screenings (yearlings).

Group V.—Alfalfa alone (yearlings).

Group VI.—Alfalfa and roots (yearlings).

In calculating the cost of feeding the following prices were charged:—

Alfalfa hay	$12.00 per ton.
Meal mixture (2 oats, 2 wheat, and 1 bran)	20.00 per ton.
Screenings	5.00 per ton.
Roots (turnips)	3.00 per ton.

Attention is called to the fact that we are charging $12 per ton for hay this year while $10 per ton was used in calculating the results of last year's experiment. We also made a change in the price of roots, charging $3 instead of $2.50 per ton, as was done last year.

The meal mixture was made up of two parts of oats, two parts of wheat and one part of bran.

The screenings were obtained from the Taylor Milling and Elevator Co. of Lethbridge. They were very light, indeed, but with them was mixed some badly damaged wheat. This wheat had heated in the bin and was in bad condition.

All the sheep except group VI were sold March 27. The Swift Canadian Company took 220, one double decked car; and a local firm, Geo. Delaney, took 14 head. A flat price of 6·50 cents per pound for both the lambs and the yearlings was obtained. Lot VI was held to be disposed of later, the idea being to shear them before selling.

In the following table, however, the results obtained from this group are given the same as if they had been sold. They were not given any grain until eighteen days before the close of the experiment. Group V, the one getting alfalfa alone, was started with grain 47 days before the close of the period.

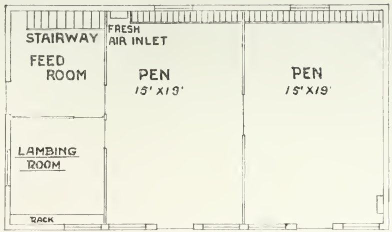
GENERAL STATEMENT.

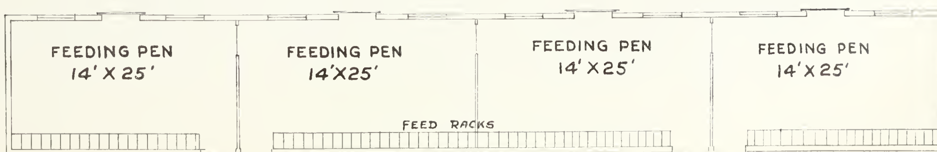
—		Lot I lambs.	Lot II yearling wethers.	Lot III yearling wethers.	Lot IV yearling wethers.	Lot V yearling wethers.	Lot VI yearling wethers.
Number of lambs or yearlings in lot at beginning of period		41	50	50	48	48	48
Number of lambs or yearlings in lot at end of period.		41	49	50	48	46	48
Number of days in experiment		117	117	117	117	117	117
Total weight at beginning of experiment	lb.	2,866	3,783	3,783	3,653	3,648	3,600
Average weight per head at beginning of experiment	"	69·9	75·66	75·66	76·1	76·0	75·0
Total weight at beginning of experiment after deducting weight of loss above	"	....	3,707	....	....	3,496	....
Total weight at end of experiment	"	4,256	5,086	5,106	5,016	4,241	4,420
Gain per period	"	1,390	1,379	1,323	1,363	745	820
Gain per head per period	"	33·9	28·14	26·46	28·4	16·2	17·08
Gain per head per day	"	·289	·240	·226	·242	·138	·146
Quantity of meal eaten by lot for period	"	4,490	5,237	5,601	.. . .	2,318	536
Quantity of screenings eaten by lot for period	"	....	....	.... ..	6,303	....	......
Amount of alfalfa hay eaten by lot for period	"	7,660	10,425	10,861	10,668	11,769	12,904
Quantity of roots eaten by lot for period	"	6,054	7,240	....	... .	....	11,110
Total cost of feed	$	99·94	125·78	121 17	79·76	93·79	99·45
Cost of feed eaten by the 41, 46, 48, 49 or 50 respectively	"	99·94	124·50	121·17	79·76	91·80	99·45
Cost of feed per head for period	"	2·44	2·54	2·42	1·66	2·00	2·07
Cost of feed per head per day	cts.	2·09	2·17	2·07	1·42	1·71	1·77
Cost to produce one pound gain	"	7·19	9·03	9·16	5·85	12·32	12·13
Original cost of yearling wethers at $3.75 per head	$	.. ....	183·75	187·50	180·00	172·50	180·00
Original cost of lambs at 5¼ cents per pound	"	150·46	....	....	....	....	....
Original cost of sheep plus cost of feed	"	250·40	308·25	308·67	259·76	264·30	279·45
Sold at 6·50 cents per pound live weight	"	276·64	330·59	331·89	326·04	275·66	287·30
Net profit on lot	"	26·24	22·34	23·22	66·28	11·36	7·85
Net profit per lamb	"	·64	·46	·46	1·38	·25	·16

Looking towards the Buildings. Experimental Station, Lacombe.

Sheep feeding Shed with sheep Barn in background. Experimental Farm, Indian Head, Sask.

SHEEP SHEDS. EXPERIMENTAL FARM INDIAN HEAD, SASK.





EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT—P. H. MOORE, B.S.A.

In the line of sheep we are keeping the Horned Dorset breed exclusively, and we have at present fifteen ewes (ages ranging from one to four years), one two-year-old ram and ten ewe lambs. We have had to do very severe culling in the flock in order to get rid of some of the old ewes which had proven non-breeders and also two young ewes which became excessively fat. We have only one ewe which has produced a double crop of lambs in the season. Number 41 gave birth to a ram lamb on February 18, 1912 (this lamb was sold to the butcher); on September 6, 1912, she gave birth to twin lambs (one ram and one ewe), and again on March 31, 1913, she gave birth to one ewe lamb. Many of the sheep have had twin lambs, and some of the best have been saved to sell as breeders, while the rest of them have been disposed of to the butcher. We have had just one fatality, and this was caused by maggot in the head *(Oestris ovis)*. We have had one case of pneumonia, which did not prove fatal, and are also pleased to be able to report that there have been no losses from wild animals; this, we think, is accounted for by the sheep having access to the lanes leading to the buildings and not being confined to the bush pastures close to the mountain. The sheep have been allowed to run in the same pastures with the cattle and have always kept in excellent condition without any extra assistance, with the exception of a short period while the snow was on the ground, at which time they received clover hay and turnips. At lambing time they received a mixture of oats and bran for a short period; this, at the local market price, would cost about $1 per sheep. The total outlay for food for the whole flock during the winter amounted to $2.90 per sheep. The rest of the year they got their living from the pastures, and have always kept in excellent condition.

SWINE.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION ANIMAL HUSBANDMAN.—E. S. ARCHIBALD, B.A., B.S.A.

SWINE.

There are one hundred and fifty-one head of swine of all classes, which are either being fed experimentally or kept for breeding purposes. The breeds kept are Berkshire, Yorkshire and Tamworth.

The Yorkshires are 85 in number, including 31 breeding sows, 52 young pigs and 2 stock boars.

The Berkshires are 26 in number, including 11 breeding sows, 13 young pigs and 2 stock boars.

The Tamworths are 40 in number, including 17 breeding sows, 20 young pigs and 3 stock boars.

The main piggery, erected in 1910, continues to give satisfaction in all respects. The housing of brood sows during both winter and summer in the single board cabins has also continued to give excellent results.

The increasing sales and demand for young breeding pigs is a healthy indication of the increasing interest of farmers, both in the Experimental Farms and in their own herds.

The experimental feeding work, part of which may be found below, was conducted and compiled by Mr. Gray and has been quite satisfactory.

Pig Feeding Experiments.

1.—Value of green feed in replacing meal.

The object of this experiment was to discover the value of green feed for market hogs.

Fourteen uniformly good hogs, about three months of age, were divided into two lots of seven each.

Both lots were fed in a pen sufficiently large to give all exercise necessary.

The meal mixture was composed of equal parts of shorts and Schumacker feed.

The green feed consisted of green clover. Green feed was cut and hauled to the pen daily.

The two lots were fed as follows:—

Lot. I.—Meal mixture, 5 pounds of skim milk per pig per day, and all the green clover they would clean up.

Lot II.—Meal mixture and 5 pounds of skim milk per pig per day.

In computing results, food stuffs were charged as follows:—

Meal mixture	$28.00 per ton.
Green feed	3.00 per ton.
Skim milk	.15 per cwt.

Test 1.—Pig Feeding Experiment.

—	Lot I. Meal, milk and green feed.	Lot II. Meal and milk.
Number of animals in each lot	7	7
First weight, gross ... lb.	526	574
First weight, average per pig ... "	65·7	71·6
Finished weight, gross ... "	1,261	1,384
Finished weight, average per pig ... "	157·6	173·0
Number of days in experiment ... days.	84	84
Average gain per pig for period ... lb.	91·9	100·0
Average gain per pig per day ... "	1·09	1·19
Amount of meal consumed ... "	1,892·00	2,726·00
Amount of milk consumed ... "	3,360	3,360
Amount of green feed consumed ... "	3,600	
Total cost of feed for period ... $	36·92	43·20
Cost of feed per pig for period ... "	5·28	6·17
Cost of feed per pig per day ... cts.	6·2	7·3
Cost to produce 1 pound gain live weight ... "	4·1	5·2

Deductions from test.—Results, which were quite satisfactory, pointed to the following conclusions:—

1. Greater daily gains may be made from the meal and milk ration but more economical gains are made by an addition to ration of green cut clover.

2. The pigs of lot I, receiving clover, were, at the conclusion of the experiment, not quite as well finished as those of lot II, but having greater bone and muscular development, were in splendid shape to take a short finish for market.

3. Pigs in lot I were at all times on feed while two pigs in lot 2 went off feed and others showed tendencies that way. This again shows the conditioning and regulating influences of green feed.

4. The 3,600 pounds green feed given lot I was replaced by 834 pounds meal mixture for lot II. Hence, for total gains, 3,600 pounds green feed is equivalent to 580 pounds meal mixture. In other words, when shorts and Schumacker are fed as above, and this meal mixture costs $28 per ton, then green cut clover may replace one-sixth of the meal ration and is then worth $4.51 per ton.

Test 2.—Winter Feeding.

Object of Experiment.—To test comparative value of feed flour, middlings, milk and turnips, in rations for pork production.

Samples of the feeds were taken, and chemical analyses will be used as a check on future experimental work of this nature.

Plan of Experiment.—Fifty young pigs were divided into five lots of ten each. Each lot subdivided into two pens of five each.

Lot.	Ration.	How Mixed.	How Fed.
I.	Barley—ground Oats— "	Equal parts.	A water slop.
II.	Barley—ground Oats— " Milk—(skim)	Equal parts. 3 pounds per pig per day.	A milk slop.
III.	Barley—ground Oats— " Turnips	Equal parts. Boiled.	Water added to mixed ration as needed.
IV.	Barley—ground Oats— " Middlings	Equal parts of each.	Water slop.
V.	Barley-ground Oats— " Feed flour	Equal parts of each.	Water slop.

In computing results, the foodstuffs were charged at the following rates:—

Barley	$28.00 per ton.
Oats	26.00 per ton.
Middlings	28.00 per ton.
Feed flour	33.00 per ton.
Milk	.20 per cwt.
Turnips	2.00 per ton.

The following tables give the details of the experiment:—

Lot I.—Barley and Oats.

		Lot I.		Average for Lot I.
		Pen 1.	Pen 2.	
Number of animals		5	5	10
First weight, gross, December 12, 1912	lb.	422	828	1,250
First weight, average	"	84·4	165·6	125·
Finished weight, gross, February 13, 1913	"	741	1,137·	1,878·
Finished weight, average	"	148·2	227·4	187·8
Number of days in experiment	days	63·	63·	63
Average gain per pig for period	lb.	63·8	61·8	62·8
Average gain per pig per day	"	1 01	·98	·99
Amount of meal consumed	"	1,148·	1,475·	2,623·00
Amount of roots consumed	"	....	....	
Amount of milk consumed	"	....	....	
Total cost of feed for period	$	15·49	19·91	35·40
Cost of feed per pig for period	$	3·09	3·98	3·54
Cost of feed per pig per day	cts.	4·90	6·31	5·60
Cost to produce 1 pound gain live weight	cts.	4·80	6·40	5·60

N.B.—1. The heavier and older pigs of pen 2 made more costly and slower gains than pen 1, as would be expected.

Lot II. Barley, Oats and Milk.

—		Lot II. Pen 1.	Lot II. Pen 2.	Average for Lot II.
Number of animals		5	5	10
First weight, gross, December 12, 1912	lb.	346	458	804
First weight, average	"	69·2	91·6	80·4
Finished weight, gross, February 13, 1913	"	720	906	1,626
Finished weight, average	"	144	181·2	162·6
Number of days in experiment	days	63	63	63
Average gain per pig for period	lb.	74·8	89·6	82·2
Average gain per pig per day	"	1·18	1·42	1·30
Amount of meal consumed	"	974	1,342	2,316
Amount of roots consumed	"	....	....	....
Amount of milk consumed	"	945	945	1,890
Total cost of feed for period	$	14·56	19·52	34·0
Cost of feed per pig for period	"	2·91	3·90	3·4
Cost of feed per pig per day	cts.	4·6	6·2	5·4
Cost to produce 1 pound gain live weight	"	3·90	4·30	4·1

N.B.—Here again the younger and lighter pigs made more economical gains.

Lot III.—Barley, Oats and Cooked Turnips.

—		Lot III. Pen. 1.	Lot III. Pen. 2.	Average for Lot III.
Number of animals		5	5	10
First weight, gross, December 12, 1912	lb.	418.	854.	1272
First weight, average	"	83.6	170.8	127.2
Finished weight, gross, February 13, 1913	"	727	1199	1926
Finished weight, average	"	145.4	239.8	192.6
Number of days in experiment		63.	63.	63.
Average gain per pig for period	"	61.8	69.	65.4
Average gain per pig per day	"	.98	1.09	1.03
Amount of meal consumed	"	1072.	1465.	2537.
Amount of roots consumed	"	1072.	1465.	2537.
Amount of milk consumed	"	....	....	....
Total cost of feed for period	$	15.54	21.23	36.77
Cost of feed per pig for period	$	3.11	4.25	3.67
Cost of feed per pig per day	cts.	4 93	6.74	5.83
Cost to produce 1 pound gain live weight	"	5.0	6.1	5.55

N.B.—Here again the younger and lighter pigs made more economical gains.

Lot IV.—Barley, Oats and Middlings.

—	Lot IV.		Average for Lot IV.
	Pen 1.	Pen 2.	
Number of animals	5	5	10
First weight, gross, December 12, 1912 ... lb.	418	350	768
First weight, average ... "	83·6	70	76·8
Finished weight, gross, February 13, 1913 ... "	738	617	1,355
Finished weight, average ... "	147·6	123·4	135·5
Number of days in experiment ... days	63	63	63
Average gain per pig for period ... lb.	64	53·4	58·7
Average gain per pig per day ... "	1·01	0·83	0·92
Amount of meal consumed ... "	1,019	1,021	2,040
Amount of roots consumed ... "	....	....	....
Amount of milk consumed ... "	....	....	....
Total cost of feed for period ... $	14·26	14·29	14·27
Cost of feed per pig for period ... $	2·85	2·85	2·85
Cost of feed per pig per day ... cts.	4·52	4·52	4·52
Cost to produce 1 pound gain live weight ... cts.	4·40	5·30	4·85

N.B.—In this lot the heavier pigs made more economical gains.

Lot V.—Barley, Oats and Feed Flour.

—	Lot V.		Average for Lot V.
	Pen 1.	Pen 2.	
Number of animals	5	5	10
First weight, gross, December 12, 1912 ... lb.	354	551	905
First weight, average ... "	70·8	110·2	90·5
Finished weight, gross, February 13, 1913 ... "	592	907	1,499
Finished weight, average ... "	118·4	181·4	149·9
Number of days in experiment ... days	63	63	63
Average gain per pig for period ... lb.	47·6	71·2	59·4
Average gain per pig per day ... "	0·75	1·13	0·94
Amount of meal consumed ... "	836	1,272	2,108
Amount of roots consumed ... "	....	....	....
Amount of milk consumed ... "	....	....	....
Total cost of feed for period ... $	12·12	18·44	30·56
Cost of feed per pig for period ... $	2·42	3·68	3·05
Cost of feed per pig per day ... cts.	3·84	5·84	4·84
Cost to produce 1 pound gain live weight ... cts.	5	5·10	5·05

N.B.—Here again the younger and lighter pigs made more economical gains.

Deductions from experiment are as follows:—

1. Skim milk is an outstandingly cheap pork producer. Comparing lot II with lot I we notice:—

(1) One pound mixed barley and oatmeal equals 1·7 pounds milk. If meal is worth $27 per ton, then milk has a value of 79c. per cwt. when fed as above.

(2) For light hogs, 70 pounds and up, 400 pounds milk is as good as 100 pounds ground meal (oats and barley) which, when fed at 3 pounds per hog per day and above meal worth $27 per ton, makes milk worth about 34 cents per cwt.

(3) For heavier hogs in lot II vs. lot I, the skim milk was worth 28 cents per cwt.

2. Middlings was the next cheapest substitute for a part of the 'oats and barley meal.' Comparing lot I with lot IV, we find that when oat and barley meal is worth $27 per ton, that middlings, when fed as one-third of meal ration may be worth $44 per ton, one pound middlings being worth 1·63 pounds oat and barley mixture.

3. Younger and light pigs did not take readily to feed flour nor would any of either pen in lot V take large quantities of this meal. Nevertheless, this lot stood third in order of economy of production. Comparing lots V and I, we find if the barley and oat meal is worth $27 per ton, then feed flour may replace one-third of said meal and have a value of $42.15 per ton, one pound feed flour being worth 1·56 pounds oat and barley mixture.

Probably if a smaller quantity had been used, in proportion to the oat and barley meal, the heavy, sticky nature of the meal would not have been so objectionable with these pigs.

4. Cooked turnips added to the meal ration economized but little over the meal (oat and barley) alone.

Comparing lot I and III, we notice that if oat and barley meal is worth $27 per ton, then cooked turnips are worth $2.30 per ton, one pound oat and barley mixture being worth 11·8 pounds cooked turnips. The cost of cooking the turnips was not here included. This would point to the inadvisability of cooking turnips for feeding hogs.

5. I should advise readers to compare the foregoing experiment with an experiment reported in the last annual report. By so doing there will be noticed similar results, namely:—

First, as to the great value of skim milk.

Second, as to the but slightly more economical pork production by feeding cooked turnips rather than raw, the cost of cooking not considered.

Third, that meal (oats and barley) as a water slop is the most expensive foodstuff when fed alone.

FINANCIAL STATEMENT.

Below are submitted inventories and returns for the swine on the Central Experimental Farm during the year April 1, 1912, to March 31, 1913.

In spite of the expense incurred by the extra labour of experimental work, this branch has again shown a profit.

Summary of Piggery Operations 1912-13.

Sales during year	$2,603.89	
Value of manure	200.00	
Value of pigs on hand April 1, 1913	4,157.00	
		$6,960.89
Cost of feed and bedding	$1,653.75	
Cost of labour	940.00	
Value of stock on hand April 1, 1912	4,107.25	
		$6,701.00
Profit for year		$ 259.89

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT—R. ROBERTSON.

BREEDING SWINE.

The herd of swine at present on the Farm consists of 1 Yorkshire boar, 2 Yorkshire sows, 1 Berkshire boar and 1 Berkshire sow.

EXPERIMENTS WITH SWINE.

To determine the value of feeding skim milk to swine, a test was made with two lots of five each, termed lot I and lot II. Both lots were fed a uniform meal ration throughout the test, lot I being fed 3 pounds skim milk per pig per day, and lot II being fed 6 pounds skim milk per pig per day. For the first six weeks of this test a small quantity of oil cake, averaging 1 pound per day for each lot, was fed dry, mixed with an equal weight of crushed oats, and during that period shorts only, were fed mixed with the milk. After the first six weeks the meal mixture consisted of equal parts, by weight, of crushed oats, crushed barley and shorts.

In computing results, food stuffs were charged for at the following rates:—

Meal mixture	$30.00 per ton.
Skim milk	.20 per cwt.

PIG FEEDING EXPERIMENT.

———		Lot I.	Lot II.
Number of pigs in lot		5	5
Total weight at beginning of experiment	lb.	160	150
Average weight at beginning of experiment	"	32	30
Total weight at end of experiment	"	702	835
Average weight at end of experiment	"	140	167
Gain per pen in 132 days	"	542	685
Gain per pig in 132 days	"	108	137
Average gain per pig per day	"	·81	1·03
Amount of meal consumed	"	1,850	1,850
Amount of skim-milk consumed	"	1,980	3,960
Total cost of feed for period	$	31 71	35 67
Cost of 1 pound gain live weight	cts.	5·8	5·2

Deductions.—The following points of interest and value might be noted in the results of above experiment:—

1. That profitable pork may be produced by winter feeding of young feeders.

2. The extra 1,980 pounds of skim milk produced an extra gain of 143 pounds pork. As the finished pork was worth 8 cents live weight, this extra milk was worth 57 cents per cwt.

Tamworth Sows (10 months of age) in Winter Quarters. Central Experimental Farm, Ottawa.
Note: (1) Uniformity of sows; (2) Good condition and comfort in these quarters.

Swine Cabins. Central Experimental Farm, Ottawa. Winter quarters for brood Sows.
Note: (1) Structure of cabins; (2) Exercising yards made of hurdle fences.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT—W. C. McKILLICAN, B.S.A.

BREEDING SWINE.

There are nineteen swine on the Farm at present. These are divided between two breeds as follows:—

Yorkshire: 3 sows, 1 boar and 9 young pigs.

Berkshire: 2 sows and 4 young pigs.

During the year the following young pigs were sold to farmers, for breeding purposes: 2 Yorkshire boars, 1 Yorkshire sow and 2 Berkshire boars. Thirty-one bacon pigs were sold to the butcher, at prices from 7¼ to 8½ cents per pound.

FEEDING EXPERIMENTS.

BARLEY VS. SHORTS.

An experiment was conducted, in which chopped barley was compared with shorts aas a feed for young pigs, averaging 70 to 75 pounds in weight, at the beginning of the test. The pigs used were from early fall litters, and had received no milk or any commercial substitute for it. Up to the start of the experiment, they had been fed on shorts, barley and feed flour.

They were divided, on December 14, 1912, into two lots, as nearly evenly as possible; there were three Berkshires and one Yorkshire in each lot. One lot received barley chop, and the other shorts; in addition, both lots received a small quantity of feed flour and some mangels. The quantities fed daily at the start were: Barley or shorts, 2¼ pounds per pig; feed flour, ¾ pound per pig; mangels, 2 pounds per pig.

These quantities were increased as the pigs grew. It was found that the pigs on the barley could use more feed, and they were consequently given a little heavier ration. The quantities in each case were kept to what the pigs would clean up with relish. The grain feeds were purchased at the following rates: Barley, $15 per ton; shorts, $20 per ton; feed flour, $28 per ton. The mangels were grown on the Farm and are valued at $3 per ton. The results are as follows:—

—		Lot I.	Lot II.
Number of pigs in lot	lb.	4	4
Weight at start of test, December 14, 1912	"	292	282
Weight at end of test, February 14, 1913	"	492	425
Gain in two months	"	200	143
Gain per pig per day	"	·81	·58
Total amount of barley fed	"	708	.....
Total amount of shorts fed	"	.....	637½
Total amount of feed flour fed	"	248½	248½
Total amount of mangels fed	"	488½	488½
Total cost of feed	$	9 52	10 58
Cost of feed per 100 pounds gain in weight	$	4 26	7 40

This is a decided victory for barley. Of course, it would not always be possible to buy barley at ¾ cent per pound, but even if it were the same price as the shorts, the results would still be in its favour. It is possible that the similarity between the shorts and feed flour made the ration that contained both not so palatable and well balanced as the one that had barley and feed flour, and part of the failure of the shorts is due to that cause.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT—G. H. HUTTON, B.S.A.

SWINE.

The Animal Husbandry Division of the Central Experimental Farm sent this Station four pure-bred Yorkshire sows. These, with one Berkshire sow, constitute the stock of breeding hogs. A fall litter of six Yorkshire pigs are now being fed for market.

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT—P. H. MOORE, B.S.A.

SWINE.

It is gratifying to be able to report a substantial increase in the number of hogs kept on the Farm, nearly all the increase coming from our own breeding. There has been a very great demand during the year for breeding stock, particularly the Yorkshire breed (which we are now keeping exclusively) and we have not been able to supply this demand within seventy per cent. The demand has come chiefly from the newer sections of the country, and from farmers who do not know of other places to locate stock. Our herd is still headed by Summerhill Jerry 21st, and there are now on hand eleven brood sows, ranging in age from nine months to four years.

Although this branch has been greatly handicapped by lack of adequate accommodation, we have come through the year with few losses, and the hog branch has proved one of the most remunerative on the Farm.

During the early winter we fitted up an old hen-house, and in this ran a bunch of hogs on experimental work. Although the conditions were not all that could be desired, some information has been collected, and while the progress of the work which we are reporting does not prove definitely the value of the food, we are publishing a summary of the work as carried on to date. The work is still being followed up under summer conditions with new hogs, and if we are fortunate enough to have the hogs next winter, we intend to finish up this work in good shape.

HOG-FEEDING EXPERIMENTS.

On account of the number of inquiries coming to the Farm regarding the food value of rice meal, we decided to make a few trials with it for hog feeding. This meal is a by-product from rice mills. It seems light, but fibrous, and contains some cracked rice. The analysis made by Mr. F. T. Shutt, Dominion Chemist, is as follows:—

	Per Cent.
Moisture	10·54
Protein	11·44
Fat	11·25
Carbohydrates	53·36
Fibre	6·13
Ash	7·28

SUMMER FEEDING.

We used for this experiment some half-bred Yorkshire pigs and several pure-breds which were not good enough in all points to register as breeders.

They had a moderate amount of exercise in the yards, and were run four to a pen. They were fed three times daily and kept well bedded, but the yards sometimes got quite dirty. The grain and milk was weighed at each meal, but clover, green peas and oats were fed *ad libitum.*

Ration.	Average gain daily.	Food for 100 Pounds Gain.	
		Grain.	Milk.
	Lb.	Lb.	Lb.
Wheat shorts, milk, and green food	1·16	210·	851·2
Wheat shorts, one-third peas, oats, barley, one-third rice meal, one-third milk and green food	1·1	276·	900·1
Oats, peas and barley (ground), milk and green food	1·42	211·	703·4

WINTER FEEDING.

In the winter feeding trial, eight pens were used, four pigs in each pen and eight pigs on each ration. The breeds consisted of nine pure-bred Yorkshires, grade Yorkshires and Yorkshire and Berkshire crosses. The ages ranged from six months to three months. The pigs were sorted to get equal weights in each pen, and a pen of large and one of small pigs were used in each trial, as it was impossible to get enough pigs all the same age, breeding and size. They were confined in pens, eight feet by nine feet, and not allowed outside. The pens were cleaned out every alternate day and kept well bedded with cut straw. They were in an old well-lighted building on a plank floor two feet above the ground. During cold weather they were too cold, but at all times they had sufficient fresh air. The food was weighed to them for each meal, and each pen got what it could eat up clean. The pens fed rice meal grew a very heavy coat of hair and looked rough throughout. Several times the pigs in these rice meal pens stiffened up and refused food, even when having less food at the time than their neighbours. They had to be dosed with Epsom salts. The other pens were always hungry and active throughout the trials. In contrast to the summer trials each pig received only two and one-half pounds of skim milk instead of fifteen pounds daily.

Rice meal *vs.* wheat shorts; fed in conjunction with skim milk and mangels:—

Ration.	Average daily gain.	Food for 100 Pounds Gain.				Dressed meat.
		Grain.	Milk.	Mangels	Total.	
	Lb.	Lb.	Lb.	Lb.	Lb.	Per cent.
Rice meal, milk and mangels	.7075	365	355	785	1505	77·8
Wheat shorts, milk, mangels	1.176	240	233	518	991	77·8

Rice meal and wheat shorts, equal parts by weight, *vs.* oats, peas, barley (home grown) and wheat shorts, equal parts fed with mangels or milk:—

Ration.	Average daily gain.	Food for 100 Pounds Gain.				Dressed meat.
		Grain.	Milk.	Mangels.	Total.	
	Lb.	Lb.	Lb.	Lb.	Lb.	Per cent.
Rice meal, wheat shorts, milk and mangels	·925	248	263	526	1037	77·57
Oats, peas and barley, wheat shorts, milk and mangels...	1·04	247	243·5	489	979·5	75·82

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM

THE DIVISION OF FORAGE PLANTS

For the Year Ending March 31, 1913

PREPARED BY

The Dominion Agrostologist, Central Farm, Ottawa.	M. O. Malte, Ph.D.
Superintendent, Experimental Station, Charlottetown, P.E.I.	J. A. Clark, B.S.A.
Superintendent, Experimental Farm, Nappan, N.S.	R. Robertson.
Superintendent, Experimental Station, Cap Rouge, Que.	G. A. Langelier.
Superintendent, Experimental Farm, Brandon, Man.	W. C. McKillican, B.S.A.
Superintendent, Experimental Farm, Indian Head, Sask.	Angus Mackay.
Superintendent, Experimental Station, Rosthern, Sask.	W. A. Munro, B.S.A.
Superintendent, Experimental Station, Scott, Sask.	R. E. Everest, B.S.A.
Superintendent, Experimental Station, Lethbridge, Alta.	W. H. Fairfield, M.S.
Superintendent, Experimental Station, Lacombe, Alta.	G. H. Hutton, B.S.A.
Superintendent, Experimental Farm, Agassiz, B.C.	P. H. Moore, B.S.A.
Experimentalist, Substation at Fort Vermilion, Alta.	Robert Jones.

REPORT

FROM

DIVISION OF FORAGE PLANTS

J. H. Grisdale, Esq., B.Agr.
Director, Dominion Experimental Farms,
Ottawa, Ont.

Sir,—I have the honour to submit herewith the report of the Division of Forage Plants for the year ending March 31, 1913.

In the following pages are presented the results of the work with forage plants, including Indian corn, field roots, alfalfa, clovers and grasses, carried out at the Central Experimental Farm, as well as at the branch Farms and Stations.

To the experiments with forage plants which, before the Division of Forage Plants was established, consisted chiefly in testing of different varieties to ascertain their comparative value, has been added, during the year, breeding work with alfalfa, clovers, timothy and orchard grass.

In starting the breeding work, as well as in keeping the records for the experiments already under way when the Division was established, much valuable assistance has been given by Mr. F. S. Browne, B.S.A., who, from August 1, 1912, to March 31, 1913, acted as foreman in the most faithful and competent manner.

I have the honour to be, Sir,
Your obedient servant,

M. O. MALTE,
Dominion Agrostologist.

CENTRAL EXPERIMENTAL FARM, OTTAWA, ONT.

REPORT OF THE DOMINION AGROSTOLOGIST—M. O. MALTE, Ph.D.

INDIAN CORN.

The whole season was rather unfavourable for experiments with Indian corn. The very wet weather during the first part of June and the appearance of the larvæ of the Click beetle *(Cryptohypnus abbreviatus)* necessitated re-sowing in the middle of June to such an extent that the results of the comparative tests can be used only approximately.

Date of sowing, June 15. Date of cutting, September 30. Planted in hills 36 inches apart each way.

INDIAN CORN.—Test of Varieties.

Number.	Name of Variety.	Condition when cut.	Weight per acre.	
			Tons.	Lb.
1	Champion White Pearl	Grain very soft	22	1,000
2	Early Mastodon	" "	21	1,200
3	Angel of Midnight,	" "	17	1,300
4	Improved Leaming	" beginning to harden.	24	300
5	Early Longfellow	" " to glaze	14	100
6	Early Compton	" " to harden.	13	1,900
7	Salzer's North Dakota	" " "	16	1,400
8	White Cap Yellow Dent	" half hard	13	400
9	Eureka	" soft	12	1,100
10	Woods Northern	" very soft	12	1,600
11	Salzer's All Gold	" " "	10	400
12	Superior Fodder	" soft	22	1,700
		Average	16	1,700

FIELD ROOTS.

Four main groups of field roots were experimented with during the year 1912-13, viz. turnips (including swedes), mangels, carrots and sugar beets.

Of each of these groups, a number of varieties were grown in order to determine their yielding power. Each variety was grown in two rows, the length of the rows and the distance between them being calculated in such a way that each variety occupied 1/100 of an acre or thereabout. The yield per acre of the crop of each variety is calculated from the weight of the crop from 1/100 of an acre.

The advantage of late pulling having been definitely proven by experiments carried out during a number of years previous to 1910, all field roots were pulled as late as possible. The exact date for the pulling of each group of field roots is given in connection with the report of each group.

The soil on which the experiments with field roots were made varied from rather light and somewhat sandy loam to clay loam.

Before sowing the land was made up in drills two feet apart and rolled so as to make a good, firm seed bed.

TURNIPS (INCLUDING SWEDES).

Date of sowing, May 25. Date of pulling, October 23 and 24. Distance between the plants in the rows, 7 inches.

TURNIPS.—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.		Yield per Acre.	
		Tons.	Lb.	Bush.	Lb.
1	Hall's Westbury	34	992	1149	52
2	Selected Purple Top Westbury	33	1110	1118	30
3	Magnum Bonum	32	92	1068	12
4	Hartley's Bronze Top	30	1780	1029	40
5	Halewood's Bronze Top	26	174	869	34
6	Perfection	30	1642	1027	22
7	Good Luck	37	872	1247	52
8	Jumbo	30	270	1004	30
9	Elephant	28	840	947	20
10	Mammoth Clyde	25	960	849	20
11	2195 Bangholm	29	800	980	00
12	Bangholm	35	1348	1189	08
13	Skirving's	36	226	1203	46
14	Kangaroo	36	520	1208	40
15	2196 Tankard	32	1678	1094	38
16	2197 Funen Bortfelder	32	464	1074	24
17	Best of All	40	1634	1360	34
18	Carter's Elephant	36	520	1208	40
19	Carter's Prize Winner	39	812	1313	32
	Average	33	144	1102	24

Early in the season the young plants were attacked to quite an extent by cutworms. It is estimated that, with the plants growing about seven inches apart in the rows, about fifteen per cent were eaten by cutworms. The gaps in the rows thus established were re-sown immediately after the damage was observed, but, in spite of all care taken, the result of the attack of the cutworms was that the crop became somewhat uneven. It must be mentioned that, as soon as the first sign of the presence of cutworms was discovered, the experimental field was sprinkled with bran, treated with Paris green. This, no doubt, prevented the experiments from being more seriously affected.

The results of the tests were more seriously influenced by club-root disease, which appeared in practically all varieties. It is hoped, however, that this disease in following years will be checked by the liberal application of lime (at a rate of two tons to the acre) which was given to the infested field in the fall after the root crop had been harvested, and early in the spring of 1913.

MANGELS.

Date of sowing, May 22 and 23. Date of pulling, October 18. Distance between the plants in the rows, 7 inches.

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Yield per acre.		Yield per acre.	
		Tons.	Lb.	Bush.	Lb.
1	Giant Yellow Globe	44	263	1,471	03
2	Selected Yellow Globe	42	60	1,401	00
3	Selected Giant Yellow Globe	39	923	1,315	23
4	Windsor Yellow Globe	45	224	1.503	14
5	Golden Tankard	26	705	878	25
6	Gate Post	31	570	1,042	50
7	Selected Perfection	28	270	937	50
8	Prize Mammoth Long Red	25	436	840	36
9	Mammoth Long Red	23	1,727	795	27
10	2194 Mammoth Long Red	19	107	635	67
11	2346 Mammoth Long Red	28	1,575	959	35
12	2191 Barres Long Yellow	24	641	810	41
13	2192 Barres Yellow Half-Long	28	226	937	66
14	2193 Red Eckendorfer	27	172	902	52
15	Danish Sludstrup	27	639	910	39
16	Danish Taaroje	25	809	846	49
17	Giant Yellow Intermediate	19	1,228	653	48
18	Giant Yellow Intermediate	24	474	807	54
19	Giant Yellow Oval	26	304	871	44
20	Giant White Half Sugar	27	78	901	18
21	Giant White Half Sugar	28	1,254	954	14
22	Giant Intermediate Sugar	26	1,705	895	05
23	2345 Half Sugar	29	1,028	983	48
	Average	29	61	967	41

In connection with the yield of different varieties of mangels it must be mentioned that the injurious effect of cutworms necessitated transplanting to quite a considerable extent, the result necessarily being that fair conclusions as to the comparative yielding powers of the different varieties were difficult to draw.

CARROTS.

Date of sowing, May 25. Date of pulling, October 20. Distance between the plants in the rows, 3 inches.

CARROTS.—Test of Varieties.

Number.	Name of Variety.	Yield per acre.		Yield per acre.	
		Tons.	Lb.	Bush.	Lb.
1	Ontario Champion	18	1,436	623	56
2	Chantenay	16	436	540	36
3	Half Long Chantenay	14	930	482	10
4	Mammoth White Intermediate	21	434	707	14
5	Giant White Vosges	17	818	580	18
6	White Belgian	21	1,218	720	18
	Average	18	545	609	5

SUGAR BEETS.

Date of sowing, May 24. Date of pulling, October 19. Distance between the plants in the rows, 6 inches.

SUGAR BEETS.—Test of Varieties.

Number.	Name of Variety.	Yield per acre.		Yield per acre.	
		Tons.	Lb.	Bush.	Lb.
1	Vilmorin's Improved (A).....	16	1,510	558	30
2	Vilmorin's Improved (B).........	16	340	539	00
3	Klein Wanzleben.......	15	85	50	25
	Average...............	15	1,978	532	58

RED CLOVER.

Twenty plots of red clover of different origin were sown in 1911. Except for Nos. 1 and 2 only one cutting was taken for hay, the second being reserved for seed production. The following table gives the yield:—

Number.	Yield per Acre. First cut, June 26.				Yield per Acre. Second cut, Aug. 23.				Total Yield per Acre.			
	Green.		Dry.		Green.		Dry.		Green.		Dry.	
	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1............	8	280	1	1,680	2	1,280	..	1,260	10	1,520	2	940
2..........	10	1,280	2	.....	2	1,040	..	1,210	13	320	2	1,210
3............	4	1,680	1	80	2nd crop reserved for seed....				4	1,680	1	80
4............	4	140	..	1,920	"		"	....	4	140	..	1,920
5............	2	1,840	..	1,200	"		"	....	2	1,840	..	1,200
6............	5	40	1	40	"		"	....	5	40	1	40
7...... . ..	5	520	1	160	"		"	....	5	520	1	160
8............	5	1,440	..	1,800	"		"	....	5	1,440	..	1,800
9............	12	480	3	.....	"		"	....	12	480	3	.....
10............	8	1,990	2	520	"		"	....	8	1,990	2	520
11......... ...	5	420	1	1,840	"		"	....	5	420	1	1,840
12............	6	560	..	1,720	"		"	....	6	560	..	1,720
13............	4	1,120	1	80	"		"	....	4	1,120	1	80
14............	Too uneven for		record.									
15............	5	560	1	600	"		"	....	5	560	1	600
16...........	8	1,200	2	20	"		"	....	8	1,200	2	20
17............	5	880	1	420	"		"	....	5	880	1	420
18	9	120	2	320	"		"	...	9	120	2	320
19............	5	800	1	560	"		"	....	5	800	1	560
20..........	5	480	1	320	"		"	....	5	480	1	320

The red clover seed produced from the above lots was generally of a rather inferior quality. This was due, not only to the season, which was far from suitable for seed production, but also to the presence of the Clover Seed Chalcid *(Bruchophagus funebris)* which infested the seed very seriously. The seed secured was saved with the intention of using it for breeding purposes in 1913.

In addition to the above-mentioned plot experiments with red clover, started in 1911, a new line of work was taken up, viz., breeding from individual plants.

A large number of samples of red clover seed were collected during the summer 1911, in different parts of Canada, principally from the provinces of Quebec and British Columbia. From these were selected, in 1912, thirty-seven samples, each of which came from one single plant. From each sample thus selected, twenty hills were planted, two feet apart each side. On account, however, of the weather conditions and other unfavourable factors, only a comparatively small number of the hills produced plants.

ALFALFA.

At the beginning of the fiscal year 1912-13, twenty plots of alfalfa, secured from different sources, were growing at the Central Experimental Farm. From these plots three cuttings were taken, the first June 22, the second July 24, the third October 3.

The yield is given in the following table:—

Alfalfa.—Yield of Different Varieties.

Number.	1st cut.				2nd cut.				3rd cut.				Total Yield.			
	Green.		Dry.		Green.		Dry.		Green.		Dry.		Green.		Dry.	
	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	7	1,720	1	1,920	5	840	1	240	2	1,240	....	1,120	15	1,800	3	1,280
2	9	680	2	640	6	720	1	810	3	1,440	....	1,980	19	840	4	1,430
3	10	1,120	2	960	5	1,400	1	1,480	3	660	....	1,920	19	1,180	5	360
4	10	320	2	680	5	680	1	1,320	3	620	....	1,820	18	1,620	4	1,820
5	9	920	2	800	3	1,360	1	120	2	180	....	1,240	15	460	4	160
6	8	1,360	2	280	4	1,280	1	1,120	1	900	....	640	14	1,540	4	40
7	7	760	1	1,940	2	1,360	....	1,680	2	1,220	....	1,280	12	1,340	3	900
8	7	320	1	1,600	4	600	1	800	3	120	....	1,320	14	1,040	3	1,720
9	6	680	1	900	3	160	....	1,920	1	1,820	....	800	11	660	2	1,620
10	5	80	1	630	3	......	...	1,910	4	.....	....	1,920	12	80	3	460
11	9	1,680	2	800	5	320	1	1,520	3	1,020	....	1,840	18	1,020	5	160
12	10	160	2	890	5	880	1	1,920	2	1,240	....	1,120	18	280	4	1,930
13	8	1,310	1	1,320	5	650	1	1,760	2	680	....	1,110	16	640	4	190
14	11	840	2	1,280	6	240	2	160	3	480	1	160	20	1,560	5	1,600
15	8	1,040	1	1,920	5	1,840	2	80	2	1,900	....	1,440	17	780	4	1,440
16	8	1,840	2	280	6	1,340	1	1,840	3	......	....	1,440	18	1,180	4	1,560
17	9	1,040	2	960	5	.....	1	1,440	3	1,020	....	1,120	18	60	4	1,520
18	7	560	1	1,760	5	160	1	1,460	3	1,640	....	1,390	16	360	4	610
19	8	640	2	160	5	560	1	1,680	3	210	....	1,090	16	1,410	4	930
20	10	920	2	1,280	2	1,600	....	1,680	3	100	....	1,390	16	620	4	350
Average	8	1,500	2	250	4	1,699	1	1,047	2	1,925	....	1,407	16	1,124	4	704

In order to ascertain the influence of self- and cross-fertilization of alfalfa on the production of seed, experiments were planned and started by Mr F. S. Browne, B.S.A. The results obtained so far seem to indicate that alfalfa plants can be readily fertilized by their own pollen. The experiments will, however, be continued during 1913 and the final results reported upon, when more data are available.

TIMOTHY.

During the summer of 1911, about 450 samples of timothy seed were collected from wild plants, the majority of which were from the province of Alberta. With a view of producing, by proper breeding, new and constant varieties of timothy of

superior quality, forty-two samples of seed were selected in 1913. Each of the samples thus selected was collected from one single plant. When selecting the samples, not only was the possibility of producing varieties superior as to yield kept in mind, but also the possibility of producing strains of a certain seed type. For this reason samples were selected, which on account of the vegetative characters of the mother plants could be expected to originate new strains of a superior quality. A few samples having certain striking seed characters were also used. The advantage of having a timothy strain, flowering at the same time as red clover was also borne in mind, and therefore, seed from early- and late-flowering mother plants was also selected.

From each of the forty-two samples a lot of seed was sown in flower pots and kept in cold frames. When the seedlings were firmly rooted, thirty young plants were picked out at random from each sample, transplanted into individual pots and later into the field three feet apart each side, making a total of 1,260 individual plants. At the close of the season these plants were doing very well.

ORCHARD GRASS.

Of this grass, which is comparatively little known in Canada, six seed samples were secured from the Plant Breeding Station at Svalof, Sweden. The seeds from these samples were sown in flower pots, and later transplanted into the field in the same way as stated above for timothy. The individual orchard grass plants thus growing in the field in 1912 entered the winter in very fine condition.

COLLECTION OF GRASSES AND GRASS SEEDS.

When visiting the Experimental Farms in the different provinces, a great number of wild grasses and grass seeds were collected. At present the wild grasses of Canada are comparatively but little known and many genera and species are what is technically termed 'critical.' With a view of gradually coming to a clear understanding of the systematic value of such critical genera and species, seed was collected from a great number of 'forms' of a doubtful systematic rank. Special attention was paid to species belonging to the genera *Agropyrum* and *Bromus*.

BROOM CORN.

During recent years quite an interest has been taken by farmers in different provinces of Eastern Canada in the growing of broom corn. The experiments with broom corn which were started at the Central Experimental Farm in 1911 by the Division of Botany have therefore been continued.

A total of twenty-three so-called varieties were sown on June 15 and 17 in rows three feet apart, but during the summer, on account of the unfavourable weather conditions, the plants made a slow growth and only a comparatively very small number of individuals reached the proper stage for harvesting, when the first late-summer frost set in.

The results obtained from the different varieties are hardly worth recording.

Cutting Alfalfa, Experimental Station, Charlottetown, P. E. I.

Turnip Crop, 1912, on the Experimental Station, Lethbridge, Alberta.

EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

REPORT OF THE SUPERINTENDENT—J. A. CLARK, B.S.A.

INDIAN CORN.

The land where the test plots were sown was very weedy and the season such that it was almost impossible to destroy the couch grass. The season was, on the whole, very unfavourable for Indian corn.

Seven varieties were sown in drills on drained, as well as on undrained land. Two varieties were also tried in hills. The latter yielded much heavier, as will be seen from the table below, than the same varieties sown in drills. This is accounted for by the land being much warmer and cleaner in the case of the hills.

The corn in drills was sown with the grain drill, in rows 36 inches apart, on the 3rd of June, and cut green October 11. It was cured as corn stover and fed to stock.

Indian Corn for Ensilage.—Test of Varieties.

No.	Name.	Weight per acre in rows, drained.		Weight per acre in rows, undrained.		Weight per acre in hills.	
		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Angel of Midnight	7	1,387	8	1,084	....	....
2	Canadian Yellow	9	1,403	8	1,197	....	....
3	Compton's Early	9	1,969	9	1,347	....	....
4	Early Mastodon	8	1,084	6	1,124	16	216
5	Longfellow	10	1,609	9	1,799	....	....
6	Leaming Selected	8	1,649	9	272	13	1,098
7	Superior Fodder	11	1,680	8	801	....	....
	Average	9	1,169	8	1,375	14	1,667

FIELD ROOTS.

TURNIPS.

Fourteen varieties of swede turnips were sown on May 31, and pulled November 14, 1912. The soil was a sandy loam, fairly light in character. Twenty tons of manure was worked into the land, and the turnips sown in drills 30 inches apart, and the young plants thinned to about fourteen inches in the rows. The yields were computed from 1/100 acre plots.

TURNIPS.—Test of Varieties.

Number.	Name of variety.	Yield per Acre.		Yield per Acre.	
		Tons.	Lb.	Bush.	Lb.
1	Mill Pond	43	1,600	1,460	00
2	Good Luck	36	800	1,213	20
3	Webb	35	1,400	1,190	00
4	Perfection	35	1,400	1,190	00
5	Jumbo	35	850	1,180	50
6	New Century	33	1,400	1,123	20
7	Hall's Westbury	33	1,100	1,118	20
8	Bangholm Selected	32	1,650	1,094	10
9	Magnum Bonum	32	900	1,081	40
10	Hartleys Bronze	32	800	1,080	00
11	Carter's Elephant	30	750	1,012	30
12	Mammoth Clyde	30	150	1,002	30
13	Hazards Improved	29	700	978	20
14	Halewood's Bronze Top	27	1,850	930	50
	Average	33	1,096	1,118	16

Turnips.—Different Dates of Seeding.

The following experiment was conducted with Bangholm Selected to determine the best date for seeding:—

—	Yield per Acre.		Yield per Acre.	
	Tons.	Lb.	Bush.	Lb.
Plot A, sown May 31	32	1650	1094	10
Plot B, sown June 7	25	1300	855	00
Plot C, sown June 14	24	950	815	50
Plot D, sown June 21	16	1900	565	00
Plot E, sown June 28	20	1150	685	50

Experiments with Club-root on Turnips.

The experiment outlined by the Division of Botany, Central Experimental Farm, in 1911, was continued in part. A section that had been treated in 1911 with lime was seeded with Hall's Westbury. The lime had been applied as shown in the following table:—

—	Yield per Acre.		Yield per Acre.		Yield per Acre of Diseased Roots.	
	Tons.	Lb.	Bush.	Lb.	Tons.	Lb.
Plot 1 received no treatment	4	580	143	00	4	580
Plot 2 received 150 bushels unslaked lime per acre in 1911	19	808	646	48	1	640
Plot 3 received 100 bushels unslaked lime per acre in 1911	17	188	569	28		820
Plot 4 received 75 bushels unslaked lime per acre in 1911	17	1640	594	00	1	244

An experiment with coal ashes and chloride of lime was tried on land known to be affected with club-root. The chloride of lime was applied at the rate of 2,400 pounds per acre, and at the rate of 1,200 pounds per acre, fourteen days before seeding. The coal ashes were applied at the same time at the rate of one ton per acre. The land was thoroughly worked afterwards. The coal ashes reduced the number of roots affected by the disease slightly, the chloride of lime, on the other hand, appeared to increase the disease, as there were more roots affected on the plots treated than on the check.

MANGELS.

Nine varieties of mangels were sown on May 27, in drills 30 inches apart. The young plants were thinned to about 12 inches apart in the rows. The roots were pulled October 14.

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Description of Variety.	Yield per Acre.		Yield per Acre.	
			Tons.	Lb.	Bush.	Lb.
1	Prize Mammoth Long Red	Long Red	20	1712	695	12
2	Gate Post	" "	20	260	671	00
3	Giant Yellow Globe	Globe	19	1402	656	42
4	Half Sugar White	Long White	18	1356	622	36
5	Selected Yellow Globe	Globe	18	564	609	24
6	Giant Yellow Intermediate	Intermediate	18	432	607	12
7	Perfection Mammoth Long Red	Long Red	17	1904	598	24
8	Yellow Intermediate	Intermediate	16	142	535	42
9	Dignity	Long Red	14	710	478	30
	Average		18	498	608	18

CARROTS.—TEST OF VARIETIES.

Five varieties of carrots were sown on May 27 in rows fifteen inches apart. The land was prepared in the same way as for the turnips. They were pulled November 4, 1912.

CARROTS.—Test of Varieties.

Number.	Name of Variety.	Description of Variety.	Yield per Acre.		Yield per Acre.	
			Tons.	Lb.	Bush.	Lb.
1	Mammoth White Intermediate	Half Long	22	1144	752	24
2	Improved Short White	Short	22	748	745	48
3	White Belgian	Long	18	1290	621	30
4	Ontario Champion	Long	18	1224	620	24
5	Half Long Chantenay	Half Long	17	1442	590	42
	Average		19	1970	666	10

SUGAR BEETS.

Six plots of sugar beets were grown at Charlottetown. The seed for Nos. 4, 5, and 6 was sent from the Central Farm at Ottawa, the seed for Nos. 1, 2, and 3 was obtained locally.

The sugar beets were grown to ascertain their sugar-content which, from the analysis made by the Dominion Chemist and included in a table below, shows that the beets were of very fair quality and high in sugar, except No. 6. They were sown May 27, and pulled October 22, 1912.

SUGAR BEETS.—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.		Yield per Acre.	
		Tons.	Lb.	Bush.	Lb.
1	French Very Rich	12	24	400	24
2	Klein Wanzleben B	11	308	371	48
3	Vilmorin's Improved C.	10	1648	360	48
4	Klein Wanzleben A	10	1648	360	48
5	Vilmorin's Improved A	10	1516	358	36
6	Vilmorin's Improved B	10	460	341	00
	Average	10	1934	365	34

PARTICULARS *re* Sugar-content.

	Vilmorin's Improved.				Klein Wanzleben.				Very Rich.	
—	A.		B.		A.		B.		—	
	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.
Average weight one root	1	2	1	2	1	9	1	9	1	14
Sugar in juice	17·45%		11·40%		16·97%		17.59%		14·81%	
Solids in juice	18·43		13·26		18·59		19·30		15·59%	
Co-efficient of purity	94·6		85·9		91·2		91·1		95·0%	

ALFALFA, CLOVERS AND GRASSES.

Experiments have been conducted with grasses and clovers each year at the Station. The land available had formerly been what was left over after the other work was completed, but in 1911, however, a series of plots were carefully laid off. In the spring of 1912 further work on a larger scale was undertaken. These two series are here reported upon. Seed was obtained from local dealers, from the Dominion Agrostologist, and from the Svalof Station in Sweden.

Three varieties of alfalfa were sown in 1911, in duplicate. A low area ran across the middle of all these plots. Wherever it held the water all the plants were killed out. The following table gives the average of the results:—

Test of Varieties of Alfalfa.—Yield per Acre.

—	First Cutting June 25.		Second Cutting August 3.		Third Cutting August 24.		Total Yield.	
	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
Turkestan	1	485	1	74	—	—	2	559
Northern Michigan	1	426	2	102	—	—	3	528
Hungarian	5	639	1	1,081	1	86	7	1,806
Mixed alfalfa (one-fifth acre)	2	450	—	1,400	—	—	3	850

The accompanying photo was taken when the one-fifth acre of mixed alfalfa was being cut the first time.

In 1911 two varieties of Swedish red clover and one of Swedish alsike were sown in triplicate plots. The clover was cut June 29, 1912. The average yield was as follows:—

TEST OF SWEDISH CLOVERS.

Common Swedish red clover	3 tons 1,080 pounds per acre.
Late Swedish red clover	3 tons 1,200 pounds per acre.
Swedish alsike	3 tons 420 pounds per acre.

On June 19, 1912, eleven lots of clover, six lots of alfalfa, and thirteen lots of grasses were sown in duplicate plots and in rows near the front entrance to the Station. These, with the exception of Kentucky blue grass, which missed and had to be re-sown, made a splendid growth and, at the present time, seem to have wintered well.

EXPERIMENTAL FARM, NAPPAN, N.S.

REPORT OF THE SUPERINTENDENT—R. ROBERTSON.

FIELD CROPS OF INDIAN CORN.

Five acres of corn for ensilage were grown, but owing to the cool weather in June, and so much rain at harvest time, this crop was very much below the average of other years. The yield from the 5 acres was 25 tons.

FIELD ROOTS.

All the uniform test plots of roots were grown on a clay loam that had grown clover the previous year, and the aftermath turned under in the fall of 1911. This was well worked up in the spring, when manure at the rate of twenty tons per acre was spread on the surface and ploughed under, and the land again thoroughly cultivated. Complete fertilizer was then applied at the rate of 300 pounds per acre.

TURNIPS.

Nine varieties of turnips were sown in uniform test plots of one one-hundreth acre each in drills twenty-four inches apart, and the plants thinned out to one foot apart in the rows.

Sown June 4, and harvested October 16.

TURNIPS.—Test of Varieties.

Number.	Name of Variety.	Character of Soil.	Yield per Acre.		Yield per Acre.		Description of Variety.
			Tons.	Lb.	Bush.	Lb.	
1	Halewood's Bronze Top..	Clay loam.....	31	1,000	1,050	00	Medium long, bronze.
2	Perfection Swede.......	"	31	700	1,045	00	Round, purple.
3	Carter's Elephant.......	"	29	1,600	993	20	Long, dark purple.
4	Mammoth Clyde.......	"	28	1,400	956	40	Medium round, purple.
5	Hartley's Bronze Top....	"	27	1,900	931	40	Medium long, bronze.
6	Jumbo	"	27	1,500	925	00	Long, dark purple.
7	Bangholm Selected......	"	25	1,200	853	20	Oblong, purple.
8	Hall's Westbury.. . ..	"	25	1,000	850	00	Round, purple.
9	Magnum Bonum........	"	25	700	845	00	Flat, round, purple.
	Average	....	28	333	958	53	

MANGELS.

Six varieties of mangels were sown on June 3 in test plots of 1/100 acre each, in drills twenty-four inches apart, and the plants thinned out to one foot apart in the rows. They were harvested October 14. The following are the results:—

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Character of Soil.	Yield per Acre.		Yield per Acre.	
			Tons.	Lb.	Bush.	Lb.
1	Giant Yellow Intermediate	Clay loam	25	400	840	00
2	Giant Yellow Globe	"	23	440	774	00
3	Half Long Sugar White	"	22	400	740	00
4	Gate Post	"	16	1,760	562	40
5	Prize Mammoth Long Red	"	10	1,780	363	00
6	Perfection Long Red	"	10	400	340	00
	Average		18	197	603	17

CARROTS.

Five varieties of carrots were sown in uniform test plots of one one-hundredth acre each. Sown June 3 and pulled October 16. The following yields were obtained:—

CARROTS.—Test of Varieties.

Number.	Name of Variety.	Character of Soil.	Yield per Acre.		Yield per Acre.	
			Tons.	Lb.	Bush.	Lb.
1	Improved Short White	Clay loam	16	1000	550	00
2	Mammoth White Intermediate	" "	15	700	511	40
3	White Belgian	" "	15	500	508	20
4	Half-long Chantenay	" "	14	1000	483	20
5	Ontario Champion	" "	12	500	408	20
	Average		14	1540	492	20

SUGAR BEETS.

Three varieties of sugar beets were grown in test plots of 1/100 acre each. Sown on June 3 in drills twenty-four inches apart, and the plants thinned out to one foot apart in the rows. They were pulled October 14, with the following results:—

SUGAR BEETS.—Test of Varieties.

Number.	Name of Variety.	Character of Soil.	Sown.	Pulled.	Yield per Acre.		Yield per Acre.	
					Tons.	Lb.	Bush.	Lb.
1	Klein Wanzleben	Clay loam	June 3	Oct. 14	8	200	270	00
2	French Very Rich	" "	" 3	" 14	6	200	203	20
3	Vilmorin's Improved	" "	" 3	" 14	5	100	168	20
	Average				6	833	213	53

ALFALFA.

Alfalfa was again sown this season on a piece of clay loam, well underdrained. The catch was fairly good. Below are the results from that sown in 1910, termed lot I, and that sown in 1911, termed lot II. A plot of red clover, termed lot III, was cut at the same time. The yields per acre are given as follows:—

	Yield per acre. Tons.	Lb.
Lot I. —First cutting, July 3	3	100
Second cutting, September 3	1	1,440
Total	4	1,540
Lot II. —First cutting, July 3	2	200
Second cutting, September 3	2	100
Total	4	300
Lot III.—First cutting, July 3	3	360
Second cutting, September 3	3	240
Total	6	600

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT—G. A. LANGELIER.

The season was this year a very bad one, continuous wet weather until June 15, keeping seeding back until the 22nd of the month. Then, a drought followed which only ended at the beginning of August.

A permanent location was chosen in 1912 for the test plots, and the whole area was divided into three equal parts, one for Indian corn and roots, one for cereals, and one for clover. A three-year rotation will thus be followed, and the hoed crops will come after sod, as they should, in the regular order of things, on a well-managed farm.

Besides the regular test plots, there is a small patch of more than a quarter of an acre in area for experiments with clovers and grasses.

The test plots of Indian corn were 1/50 acre, and those of the roots 1/100 acre.

INDIAN CORN FOR ENSILAGE.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when Cut.	Weight per Acre grown in Hills.
				Ins.		Lb.
1	Angel of Midnight ...	June 24....	October 2...	66	Small ears, milk stage.	1,175
2	Longfellow.	" 24...	" 2...	60	Commencing to ear. ..	625
3	Superior Fodder......	" 24...	" 2...	48	No ears.	375

TURNIPS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.		Yield per Acre.	
				Tons.	Lb.	Bush.	Lb.
1	Hartley's Bronze.....................	June 26....	Oct. 11.....	15	855	514	15
2	Perfection Swede	" 26....	" 11.....	14	1,700	495	00
3	Hall's Westbury.....	" 26 ...	" 11.....	14	1,040	484	00
4	Jumbo..	" 26...	" 11.....	14	875	481	15
5	Bangholm Selected.....	" 26 ..	" 11.....	12	585	409	45
6	Good Luck	" 26....	" 11.....	11	1,265	387	45
7	Carter's Elephant.	" 26....	" 11.....	11	1,100	385	00
8	Mammoth Clyde......	" 26....	" 11.....	11	440	374	00
9	Magnum Bonum............	" 26....	" 11.....	9	1,965	332	45
10	Halewood's Bronze Top........	" 26 ...	" 11.....	6	612	226	52

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.		Yield per Acre	
				Tons.	Lb.	Bush.	Lb.
1	Yellow Intermediate	June 22	Oct. 11	2	1,527	92	7
2	Giant Yellow Intermediate	" 22	" 11	2	1,280	88	00
3	Selected Yellow Globe	" 22	" 11	1	1,960	66	00
4	Perfection Mammoth Long Red	" 22	" 11	1	1,960	66	00
5	Half Sugar White	" 22	" 11	1	1,300	55	00
6	Prize Mammoth Long Red	" 22	" 11	1	1,135	52	15
7	Giant Yellow Globe	" 22	" 11		1,815	30	15
8	Gate Post	" 22	" 11		1,485	24	45

CARROTS.—Test of Varieties.

Number.	Name of Variety.	Date of sowing.	Date of Pulling.	Yield per Acre.		Yield per Acre.	
				Tons.	Lb.	Bush.	Lb.
1	Improved Short White	June 22	Oct. 11	2	1,197	86	37
2	Mammoth White Intermediate	" 22	" 11	1	1,547	59	7
3	Ontario Champion	" 22	" 11	1	1,300	55	00
4	Half Long Chantenay	" 22	" 11	1	1,052	50	52
5	White Belgian	" 22	" 11	1	887	48	7

SUGAR BEETS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.		Yield per Acre.	
				Tons.	Lb.	Bush.	Lb.
1	Klein Wanzleben	June 22	Oct. 11	1	1,465	57	45
2	Vilmorin's Improved A	" 22	" 11	1	1,052	50	52
3	" " B	" 22	" 11		1,155	19	15

RED CLOVER.

Clover is certainly one of the most important crops, for forage, and also as a soil improver. It seems that everything possible should be done to find out with what kind of cereal, and probably with what variety of the same cereal, and with what quantity of grain per acre, it will 'catch best.'

GRASSES.

A small quantity of seed of Rhodes grass, and of Sweet grass, received from the Dominion Botanist on March 27, 1912, was sown on a piece of light sandy loam.

Though the ground was well freed from weeds, and hand hoed, not a blade could be seen. The seed had been broadcasted, covered with a rake, and the soil compacted with a light roller.

BROOM CORN.

Two varieties of Broom corn, Tennessee Evergreen and Austrian Hundred Days, were sown on June 24. This was about three weeks too late, but the continuous rains which lasted until the 15th kept back seeding operations. The drought which afterwards followed, and only ended at the beginning of August, delayed germination, so that none of the plants headed. The rows were three feet apart, and the seed was sown with a hand 'Planet Jr.' When the plants were about three inches high, they were thinned out to about three inches in the rows. Both varieties were cut on October 2, after they had been touched by frost.

EXPERIMENTAL FARM, BRANDON, MAN.

REPORT OF THE SUPERINTENDENT—W. C. McKILLICAN, B.S.A.

EXPERIMENTS WITH INDIAN CORN.

Ten varieties of field corn were grown in uniform test rows, 66 feet long and 42 inches apart. They were sown on May 30, in black loam, that had been summer-fallowed the previous year. The following results were obtained:—

INDIAN CORN FOR ENSILAGE.—Test of Varieties.

Number.	Name of Variety.	Date of Cutting.	Average Height.	Condition when Cut.	Weight per Acre Grown in Hills. Tons.	Lb.
1	Compton's Early	Sept. 18	8' 11"	Silk	25	1,800
2	Early Eight-Rowed Canada	" 18	8' 5"	Silk	26	400
3	Free Press	" 18	5' 11"	Firm Dough	17	200
4	Gehu	" 18	5' 3"	Dough	19	1,600
5	Improved White Squaw	" 18	3' 4"	Ripe	7	200
6	Longfellow	" 18	7' 7"	Silk	20	400
7	Minnesota King	" 18	7' 9"	Early Milk	17	1,200
8	North Dakota White	" 18	8' 8"	Silk	23	1,400
9	Northwestern Dent	" 18	7' 10"	Early Milk	20	400
10	Quebec Yellow	" 18	7'	Late Milk	25	00
	Average				20	560

Quebec Yellow, a new variety originated by Professor L. S. Klinck, of Macdonald College, Que., seems very well suited to Manitoba conditions. It combines a good yield with earliness. It is not as yet available commercially, but deserves the attention of our seed merchants.

Northwestern Dent continues to combine earliness and a reasonably good yield. Compton's Early and Early Eight-rowed Canada excell in yield but are rather late for Manitoba conditions, especially for the making of ensilage.

FIVE YEAR AVERAGES.

Three of the above varieties have been grown for five years, and one other for three years. The following are the average results obtained:—

Number.	Variety.	Average Stage of Development when Cut.	Average Yield per Acre. Tons.	Lb.
1	Compton's Early	Silk	20	812
2	Longfellow	Silk	19	1,780
3	Northwestern Dent	Late milk—Early dough	15	850
4	Quebec Yellow	Dough	17	1,608

BULLETIN ON CORN GROWING.

A bulletin has been written on 'Corn Growing in Manitoba,' which will be available to all who write asking for a copy.

EXPERIMENTS WITH FIELD ROOTS.

TURNIPS.

Fourteen varieties of turnips were grown in uniform test rows. They were planted on May 9, in clay loam which had been summer-fallowed the previous year. The cool, damp weather in the latter part of the season was favourable, and an excellent crop was harvested. The crop was dug on September 27 and the following yields were harvested:—

TURNIPS.—Test of Varieties.

Number.	Name of Variety.	Description of Variety.	Yield per Acre.		Yield per Acre.	
			Tons.	Lb.	Bush.	Lb.
1	Bangholm	Purple Top Swede	33	1980	1133	00
2	Canadian Gem	" " "	39	100	1301	40
3	Carter's Imperial	" " "	30	940	1015	40
4	Garton's Model	Yellow Turnip	18	300	605	00
5	Garton's Superlative	Purple Top Swede	29	80	968	00
6	Good Luck	" " "	32	1780	1096	20
7	Halewood's Bronze Top	Bronze Top Swede	31	1360	1056	00
8	Hall's Westbury	Purple Top Swede	33	1540	1125	40
9	Hartley's Bronze Top	Bronze Top Swede	25	1920	865	20
10	Hazard's Improved Bronze Top	" " "	29	740	979	00
11	Magnum Bonum	Purple Top Swede	29	1620	993	40
12	Northwestern Purple Top	" " "	45	200	1503	20
13	Perfection Purple Top	" " "	33	1980	1133	00
14	Prize Purple Top	" " "	33	1760	1129	20
	Average		31	1879	1064	39

Five Year Averages.

Six of these varieties have been grown for five years, and one more for four years. The following are the averages obtained:—

Number.	Name of Variety.	Average.		Yield per Acre.	
		Tons.	Lb.	Bush.	Lb.
1	Halewood's Bronze Top	27	1378	922	58
2	Magnum Bonum	26	743	879	3
3	Hall's Westbury	26	448	874	8
4	Hartley's Bronze Top	25	371	839	31
5	Perfection Purple Top	25	75	834	35
6	Good Luck	23	745	779	5
7	Bangholm (average of 4 years)	29	1323	988	43

MANGELS.

Eight varieties of mangels and seven varieties of sugar mangels, or feeding sugar beets, were grown in uniform test rows. They were sown on May 9, and were harvested on September 19. The yields are calculated from the yield of a row 66 feet long. The soil was clay loam summer-fallowed the previous year. The following yields were obtained:—

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Description of Variety.	Yield per Acre.		Yield per Acre.	
			Tons.	Lb.	Bush.	Lb.
1	Elwetham Long Red	Long Red	36	1920	1232	00
2	Giant Long Red	Long Red	33	220	1103	40
3	Giant Yellow Globe	Yellow Globe	41	1160	1386	00
4	Giant Yellow Intermediate	Yellow half long	31	700	1045	00
5	Golden Tankard	Dark yellow half long	36	1040	1217	20
6	Manitoba Giant Yellow	Yellow half long	29	1180	986	20
7	Perfection Mammoth Long Red	Long Red	34	1300	1155	00
8	Prize Mammoth Long Red	Long Red	39	1640	1327	20
9	Danish Improved Sugar Beet	Long Pink	39	540	1309	00
10	Giant Half Sugar	Long Pink	34	1520	1158	40
11	Giant White	Long White	32	240	1070	40
12	Jumbo	Long Greenish white	42	700	1411	40
13	Leviathan	Long Red	35	1060	1184	20
14	Monarch Half Sugar	Long Greenish white	33	880	1114	40
15	Royal Giant	Long Pink	37	1460	1257	40
	Average		35	1837	1197	17

Five Year Averages.

Five of these varieties have been grown for five years with the following average returns:—

Number.	Variety.	Average Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Prize Mammoth Long Red	29	1,915	998	35
2	Giant Yellow Globe	29	740	979	00
3	Giant White Sugar	26	1,458	899	58
4	Perfection Mammoth Long Red	25	485	841	25
5	Giant Yellow Intermediate	21	1,966	732	46

FIELD CARROTS.

Six varieties of field carrots were tested in uniform test rows. They were planted on May 9, and harvested on October 4. The yield per acre is calculated from the yield of a row 66 feet long. The soil was clay loam, summer-fallowed the previous year.

CARROTS.—Test of Varieties.

Number.	Name of Variety.	Description of Variety.	Yield per Acre		Yield per Acre	
			Tons.	Lb.	Bush.	Lb.
1	Cooper's Yellow Intermediate	Yellow, medium short	10	1,560	359	20
2	Improved Giant White Belgian	White, very long and coarse	8	60	267	40
3	" Mammoth Long	White, long	14	1,260	487	40
4	" Short White	White, medium long.	11	1,540	392	20
5	Mammoth White Intermediate	White, long	12	200	403	20
6	Oxheart	Red, very short	7	1,620	260	20
	Average		10	1,707	361	47

Five Year Averages.

Three of these varieties have been grown for five years. The following average yields have been obtained during that period:—

Variety.	Average Yield per Acre.		Average Yield per Acre.	
	Tons.	Lb.	Bush.	Lb.
Mammoth White Intermediate	14	1,260	487	40
Improved Short White	14	435	473	55
Improved Giant White Belgian	12	1,911	431	51

EXPERIMENTS WITH ALFALFA, GRASSES AND CLOVERS.

In 1911 a series of plots of grasses, clovers, alfalfa and mixtures was sown. They were all sown without a nurse crop on fall-ploughed barley stubble. They were clipped off twice during that season. Crops were obtained from these plots in 1912. The month of June was extremely dry, and consequently the yield of the first cutting is a good indication of the drought resistant powers of the different crops. July was very wet and thus the second cutting shows what each crop can do under wet conditions. The year, as a whole, gives a very good test of these crops under the varying conditions that are likely to come.

ALFALFA.

The yielding capabilities of alfalfa are strikingly shown in the table on page 642. These are equally as well shown in the twenty-acre field. In the first week of July, after there had been six weeks of continued drought and all the other crops seemed parched, the alfalfa stood up as fresh and green as ever. Alfalfa is becoming increasingly popular in Manitoba, and while the area grown is still small, it is sure to increase greatly as soon as the land can be got ready and the crop put in. A few points on the growing of alfalfa in Manitoba may, therefore, not be out of place in this report.

Preparation of Land.

The first consideration in the growing of alfalfa is the preparation of the land. Alfalfa does best on a deep, rich, well-drained soil. It takes a plentiful supply of moisture, but cannot stand to have a stagnant flooded condition of the land. In fact, the average Manitoba farm provides soil conditions admirably suited to the growing of alfalfa. The land should be clean before alfalfa is sown. Alfalfa is hardy after it becomes established, but during the first year it needs every chance. It should therefore be sown where the land is reasonably free from weeds, and where the native grasses have been killed out. Following a crop of corn or roots, that has been kept clean, is an ideal place for alfalfa. After a summer-fallow is the best possible place, but as that means two years lost, it makes it rather an expensive crop to start. It can be sown following a grain crop, if the land is clean and in good fertility. In any case, the land should be well worked so that there is a fine, firm seed bed into which to put the alfalfa seed.

Inoculation.

On most of the land in Manitoba, it is found advisable to inoculate. In some of the scrub districts, where the wild pea vine is plentiful, inoculation does not seem to be required, but in most of the open prairie districts, decided benefits are obtained. The land that has never grown alfalfa seems to lack the bacteria that associate themselves with it. Inoculation will often gradually take place by itself, but in the meantime, there is a loss of time for the crop and of money for its owner. By artificial inoculation, it may be put on a productive basis from the start. There are two ways of inoculating, viz., by means of a bacterial culture, which may be obtained from some of the agricultural colleges, and by using soil from a field that is already growing alfalfa successfully. The latter means is most commonly used in Manitoba. Most farmers have now got a neighbour within driving distance who has an alfalfa patch from which they can get inoculating soil. Such soil may also be obtained in limited quantities from the Experimental Farm by paying the expenses for shipping.

It is supplied at the rate of 100 pounds per acre, with a limit of 500 pounds to any one farmer. As one of the railways refuses to accept this material for shipment except when the freight charges are prepaid, it has been decided to collect a uniform rate of 50c. per 100 pounds, which, when averaged up, will be about sufficient to pay all freight charges inside of Manitoba. For this sum the Experimental Farm will supply bags and pay freight charges to any point within the province.

Inoculating soil should not be exposed to the light more than is absolutely necessary, and should not be dried out. Either of these conditions kills the bacteria. It should be spread very thinly and evenly over the field and immediately harrowed in.

Seeding.

The last week in May or the first week in June is considered the best time to sow. The spring rains have started by that time, and the soil is in a moist, warm condition, suitable for the germination of small seeds. The earlier part of the season may be used in killing weeds on the land, so as to give the alfalfa a better chance In countries farther south, later sowing is the rule, but that is not advisable here, because a strong vigorous growth is needed to prepare for winter. Twenty pounds of seed per acre is required. It seems a large quantity, but one must remember that alfalfa never thickens up like other forage crops.

It should always be sown without any nurse crop. There is not enough moisture in the average season to grow a crop of grain and, at the same time, to give the

alfalfa sown with it the moisture it requires. One cannot expect a good catch of alfalfa unless it has the field to itself.

There are several good ways of applying the seed. The method used on the Experimental Farm is to sow it in the ordinary grain drill. The seed is mixed with twice its quantity of broken grains of wheat, and then the mixture sown at the rate of one bushel per acre. The wheat is broken in an ordinary grain crusher set so open that it only breaks it enough to prevent it from growing. These broken seeds are found better than chop or bran or any other material tried, as they flow more evenly and smoothly. The floury particles are screened out. The drill should be set to place the seeds about an inch apart.

First Year.

No crop is to be expected from alfalfa the year it is sown. It is engaged in the work of establishing itself. During the first year it is growing down into the earth and establishing its roots rather than making a crop of hay. It should be clipped off once during the season. Clip when any weeds begin to come in flower, so as to prevent their seeding. The clippings may be left on the ground as a mulch. Alfalfa should not be pastured the first year, as animals are likely to injure it by biting off the crowns and by tramping.

Care of Alfalfa.

Once established, an alfalfa field needs practically no care except to harvest the crop. The practice of discing in the spring is recommended. The disc should be set with almost no angle, so as not to cut off the alfalfa. This loosens up a mulch on the surface of the earth, helps to keep down the weeds, and splits some of the alfalfa crowns, making them put forth more stems and, in that way, thickening the stand.

Harvesting.

Alfalfa should be cut in early bloom. It rapidly becomes more woody, and less digestible as it approaches maturity.

A better indication than the stage of blossoms is the starting of the new growth from the root. As soon as fresh young branches are seen sprouting from the crown, it is time to cut, as the new growth then is ready to come in. If the new growth is allowed to get high enough to be cut back it gets a set-back and the second crop will be lessened or at least delayed.

Alfalfa is rather hard to cure, and requires considerable attention after cutting. The things that make it hard to cure are: (1) It grows a heavy crop of a very succulent green character and is thus hard to dry; (2) it is rather open and thus suffers easily from rain; (3) the leaves are the most valuable part, but if the crop is dried too much, or handled much, they fall off and are lost. The method found most satisfactory at the Experimental Farm is as follows: The mowing machine is started as soon as the dew is off in the morning, and kept going till noon or in the middle of the afternoon. The tedder is started about an hour and a half or two hours after the mowing machine; it shakes up the swath, opening it to the air and turning up the lower side. This operation may be done by the side delivery rake nearly as well as by the tedder, and it saves labour by making later raking unnecessary. If a heavy crop of alfalfa is left in the swath without turning, the top will dry until the leaves fall off before the bottom has even wilted. If a man has only a small area, it can be turned by hand, but if growing it extensively it will pay to have either a side delivery rake or else a tedder. At the

Experimental Farm, everything cut in the morning is raked in the afternoon, with the aim of getting it all in coils the same evening. This is not always possible, but it is found that when it is not possible to get it coiled the same day, the quality is distinctly lowered by the effect of the dew and the sunshine of the next day. If the day on which the alfalfa is cut is dry and breezy, and the weather remains fine, these coils will remain untouched till dry. The coils should be made small so that the wind can go through. This makes ideal hay. If the weather is showery, the hay is injured much less in the coil than it would have been if left spread, but will have to be shaken out again before stacking.

Alfalfa is not good stacking material, as it is very open in texture and very absorbent of water. It keeps with less waste when stored under roof. It can, however, be stacked successfully and made to shed fairly well, though there is sure to be a little loss if rain comes soon after stacking.

Distribution of Inoculating Soil.

The amount of inoculation soil distributed to the Manitoba farmers during 1912 was 22,200 pounds, for alfalfa. No applications for soil for red clover were received.

ALFALFA, VARIETY TESTS.

	—	First Cutting, July 4.		Second Cutting, August 8.		Total Crop.	
		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Common alfalfa	3	730	1	1,800	5	530
2	Common alfalfa (Canadian seed)	3	1,720	2	600	6	320
3	Common alfalfa (Montana seed)	3	320	2	600	5	920
4	Grimm's alfalfa	3	320	2	520	5	840
5	Turkestan alfalfa	3	1,480	1	1,800	5	1,280
	Average	3	914	2	264	5	1,178

GRASSES, VARIETY TESTS.

—	First Cutting, July 4.		Second Cutting, August 8.		Total Crop.	
	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
Brome Grass	3	1,320		1,600	4	920
Kentucky Blue Grass		800		1,360	1	160
Orchard Grass		800		1,200	1	00
Red Top	1	160		1,800	1	1,960
Timothy	1	760		1,800	2	560
Western Rye Grass	3	1,120		1,280	4	400

CLOVERS, VARIETY TESTS.

—	First Cutting, July 4.		Second Cutting, August 8.		Total Crop.	
	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
Alsike	1	1,400	2	400	3	1,800
Common Red Clover	1	440	2	800	3	1,240
Mammoth Red Clover	1	1,120	2	.	3	1,120
White Dutch Clover	..	..	1	1,500	1	1,500

MIXTURES.

—	First Cutting, July 4.		Second Cutting, August 8.		Total Crop.	
	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
Timothy and Red Clover	1	600	2	1,140	3	1,740
Timothy and Alsike	1	720	2	200	3	920
Timothy and Alfalfa	1	960	1	1,840	3	800
Western Rye grass and Red Clover	2	1,320	1	1,920	4	1,240
Western Rye grass and Alsike	2	1,960	1	800	4	760
Timothy, Western Rye grass and Red Clover	1	1,440	2	1,000	4	440
Timothy Western Rye grass and Alsike	2	1,200	1	1,440	4	640
Timothy, Red Clover and Alsike	1	280	2	1,000	3	1,280
Western Rye grass, Red Clover and Alsike	2	320	1	1,960	4	280
Timothy, Red Top and Alsike	1	100	2	680	3	780
Timothy, Western Rye grass, Red Clover and Alsike.	1	1,680	1	1,800	3	1,480
Timothy, Western Rye grass, Red Clover and Alfalfa	2	360	2	200	4	560

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

REPORT OF THE SUPERINTENDENT—ANGUS MACKAY.

EXPERIMENTS WITH INDIAN CORN AND ROOTS.

Indian corn and roots were satisfactory the past year. The land had been summer-fallowed the previous year, and twelve tons of well-rotted manure applied late in the fall, and disced under. In the spring, before sowing or planting, the land was double-disced or cultivated.

Corn was sown in rows three feet apart, and the yield was taken from two rows sixty feet long.

Roots were sown in rows thirty inches apart, on the flat, and the yield computed the same as corn.

Five and one-half acres of corn were grown and cut after three nights of frost; on the 14th, 15th and 16th of September. The ensilage was not injured in the least, so far as can be determined.

INDIAN CORN FOR ENSILAGE.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when Cut.	Weight per Acre grown in Rows.	
				Inch.		Tons.	Lb.
1	Longfellow	May 22	Sept. 16	78	Early milk	24	1,236
2	North Dakota White Flint	" 22	" 16	80	"	25	688
3	Compton's Early	" 22	" 16	84	"	24	48
4	Early Canada	" 22	" 16	87	"	28	760
5	Gehu	" 22	" 16	60	Late milk	23	860
6	Minnesota King	" 22	" 16	90	Early milk	23	464
7	Giant Prolific	" 22	" 16	84	"	19	1,732
8	North Western Dent	" 22	" 16	85	Late milk	22	352
	Average					23	1,768

TURNIPS.—Test of Varieties.

Number.	Name of Variety.	Character of Soil.	Size of Plot.	Character of Growth.	Sown.	Pulled.	Yield per Acre.		Yield per Acre.		Description of Variety.
							Tons.	Lb.	Bus.	Lb.	
1	Prize Purple Top	Clay loam.	1/132	Strong	May 22.	Oct. 11.	39	144	1,302	24	Large & smooth.
2	Hartley's Bronze	"	1/132	"	" 22.	" 11	36	468	1,207	48	"
3	Hall's Westbury	"	1/132	"	" 22.	" 11.	36	1,524	1,225	24	Large, very fine.
4	Invicta	"	1/132	"	" 22.	" 11.	33	1,320	1,122	00	Medium, good.
5	New Century	"	1/132	"	" 22.	" 11.	38	1,748	1,295	48	Large, very good.
6	Magnum Bonum	"	1/132	"	" 22.	" 11.	38	32	1,267	12	"
7	Elephant	"	1/132	"	" 22.	" 11.	39	672	1,311	12	"
	Average						37	844	1,247	24	

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Character of Soil.	Size of Plot.	Character of Growth.	Sown.	Pulled.	Yield per Acre. Tons.	Yield per Acre. Lb.	Yield per Acre. Bush.	Yield per Acre. Lb.	Description of Variety.
1	Giant Yellow Globe...	Clay loam.	1/132	Strong..	May 21.	Sept. 25.	38	1,220	1,287	00	Large, very fine.
2	Yellow Leviathan.....	"	1/132	" ..	" 21.	" 25.	34	1,300	1,155	00	Medium, good.
3	Perfection Mam. Long Red	"	1/132	" ..	" 21.	" 25.	35	1,412	1,190	12	" "
4	Giant Half Long Yellow..........	"	1/132	" ..	" 21.	" 25.	34	1,432	1,157	12	" "
5	Jumbo...............	"	1/132	" ..	" 21.	" 25.	39	12	1,300	12	Large, extra fine.
	Average........	....	......	....	....	....	36	1,075	1,217	55	

FIELD CARROTS.—Test of Varieties.

Number.	Name of Variety.	Character of Soil.	Size of Plot.	Character of Growth.	Sown.	Pulled.	Yield per Acre. Tons.	Yield per Acre. Lb.	Yield per Acre. Bush.	Yield per Acre. Lb.	Description of Variety.
1	Short White.........	Clay loam.	1/132	Strong..	May 21.	Oct. 14.	14	1,304	488	24	Fair size, smooth.
2	Chantenay............	"	1/132	" ..	" 21.	" 14.	12	552	409	12	" "
	Average........	....	......	....	....	....	13	928	448	48	

SUGAR BEETS.—Test of Varieties.

Number.	Name of Variety.	Character of Soil.	Size of Plot.	Character of Growth.	Sown.	Pulled.	Yield per Acre. Tons.	Yield per Acre. Lb.	Yield per Acre. Bush.	Yield per Acre. Lb.	Description of Variety.
1	Vilmorin's Improved 'A'....	Clay loam	1/132	Strong..	May 21	Oct. 14.	15	624	510	24	Medium, very rooty.
2	Vilmorin's Improved 'B'	"	1/132	" ..	" 21.	" 14.	11	1,232	387	12	" "
3	Klein Wanzleben......	"	1/132	" ..	" 21.	" 14.	12	288	404	48	" "
	Average..........	....	......	....	....	....	13	48	434	8	

Average samples of each variety were sent to Mr. F. T. Shutt, Dominion Chemist, Central Experimental Farm, for analysis. The results of the analysis are given below:—

—	Vilmorin's Improved. 'A'	Vilmorin's Improved. 'B'	Klein Wanzleben
	Lb. Oz.	Lb. Oz.	Lb. Oz.
Average weight of one root	14	1 05	14
Sugar in juice, per cent	15 52	16 69	15 14
Solids " "	18 89	19 57	18 03
Coefficient of purity	82 1	85 3	83 9

ALFALFA.

To what was said in the 1911 report respecting alfalfa growing, a few pointers may be added as to the most suitable land, cultivation, seeding, cutting, curing, etc. It was found from previous tests that a great deal depends on the first season's growth, whether alfalfa prove hardy or not. If it enters the winter with small roots, and the top has been eaten bare, it is sure to succumb. On the other hand, if the roots have taken a good hold, and a good growth has been left to protect the crown, the crop is reasonably safe. If, added to this, the precaution is taken not to pasture too closely or too late in the fall, there is no reason to doubt of its entire success. The course pursued on this Farm which has given the best results is to plough stubble land late in May, four or five inches deep; then harrow once. After harrowing, ten to twelve pounds of seed per acre is sown with a wheelbarrow grass seeder. When sown, the land is harrowed, rolled and again harrowed. The rolling firms the soil, and leaves the surface in good condition for the mower, and the last harrowing prevents evaporation.

The seed is sown without a nurse crop, and when the plants are sufficiently high the mower is run close to the ground, to kill weeds and cause the roots to take a better hold. This is repeated up to the end of July, and after that all growth is left for winter protection.

It has been found, when a nurse crop has been grown, that the plants are weakly, even if not badly killed out with the grain using up all the moisture in August. If they survive after the grain is harvested, as a rule the weather is too dry for them to make satisfactory root or top growth, and they are not in a condition to stand the thaws and frosts of April and early May.

Cultivation, Seeding and Harvesting of Alfalfa.

Alfalfa can be sown on fallowed land, or on stubble land.

Fallow.—If fallow lands drift with the winds, plough four inches deep before seeding, to overcome the danger.

Stubble.—If stubble is heavy, burn in the spring, plough five inches deep, and harrow. If land was ploughed the preceding fall, cultivate before sowing.

Seeding.—Sow 12 pounds of seed per acre, from May 25 to 31. After seeding, cross harrow twice, then roll or pack soil; do not roll fallowed land, use packer instead.

Nurse Crop.—On fallowed land, grain can be sown; oats or barley is better than wheat, as they can be delayed in seeding. Alfalfa seed should not be sown too early. On stubble land, no nurse crop should be sown, as usually the moisture is not sufficient for both and the tender alfalfa plants die. When alfalfa is up about five inches, mow close to the ground, and repeat the first week in August. Leave the last growth for winter protection. The mowing kills the weeds and strengthens the roots, which is important the first winter.

Harvesting.—Alfalfa is usually ready for the first cutting early in July, and for the second cutting the same time in August of the second year. Cut when in early blossom. Cut early in the forenoon, and if the day is fine, rake into windrows in the afternoon, and put in small cocks the next day.

Allow the hay to cure in the cocks; turning and exposing to the air will hasten drying. Have the hay well dried before stacking, for fear of spoiling.

ALFALFA, sown in 1904.

No.	Variety.	Remarks.	First Cutting		Second Cutting.		Total.	
			Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Common Alfalfa................	Medium growth.	..	1,180	..	1,090	1	270
2	Turkestan......	" "	..	1,700	..	1,450	1	1,150
	Average	....	..	1,440	..	1,270	1	710

ALFALFA, sown in 1905.

No.	Variety.	Remarks.	First Cutting.		Second Cutting.		Total.	
			Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Grimm..........	Medium growth.	1	640	1	48	2	688
2	New York....	" "	..	1,140	..	1,528	1	668
3	Samarkand (Turkestan)..........	" "	1	475	..	1,300	1	1,775
4	Nebraska	" "	..	1,550	..	1,000	1	550
	Average....	....		1,951	..	1,469	1	1,420

ALFALFA, sown in 1908.

No.	Variety.	Remarks.	First Cutting.		Second Cutting.		Total.	
			Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Grimm (Lyman Co.)...........	Strong growth..	1	1,300	1	..	2	1,300
2	Idaho	" " ..	1	1,950	1	300	3	250
3	Montana (Lyman Co.)...........	" " ..	2	600	1	1,250	3	1,850
4	Dryland (Lyman Co.)...........	" " ..	2	250	1	1,400	3	1,650
5	French Alfalfa..................	" " .	1	1,450	1	600	3	50
6	Turkestan (Lyman Co.).........	" " ..	1	1,195	1	535	2	1,730
	Average....	....	1	1,791	1	681	3	472

ALFALFA, sown in 1909.

No.	Variety.	Remarks.	First Cutting.		Second Cutting.		Total.	
			Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1	Canadian	Strong growth.	2	1,404	1	790	4	194
2	Licoq's	" "	3	1,812	not cut.		3	1,812
3	Mongolian	" "	2	1,404	1	1,860	4	1,264
4	Nephi Utah (dry land)	Medium "	1	1,853	1	316	3	169
5	Grimm	Strong "	2	1,790	1	895	4	685
6	Sextorp, Neb	Medium "	1	1,838	1	1,281	3	1,119
7	Alt Deutsche Frankische	Strong "	2	1,296	2	825	5	121
8	Provence Anbignan	Medium "	1	910		1,940	2	850
9	Wessell, Duval Peruvian.	" "	1	1,860		1,790	2	1,650
10	Baltic	" "	1	1,000		1,930	2	930
11	Wernyj (Turkestan).	Strong "	2	1,790	2	825	5	615
12	Sand Lucerne (Darmstadt)	Medium "	1	895	1	1,860	3	755
13	Chinook (Montana)	" "	1	1,281	1	1,281	3	562
14	Liefman Sand Lucerne	Strong "	2	246	not cut.		2	246
15	Sand Lucerne (Bromberg)	" "	2	18	1	412	3	430
16	Hungarian, Bouchan	Medium "	1	1,860	1	412	3	272
17	Frasinet	" "	1	1,860		1,930	2	1,790
18	Bellefontaine	Strong "	2	1,211	1	1,377	4	578
19	Mixed seed	" "	2	1,018	1	342	3	1,360
20	Old Frankish Lucerne	" "	2	640	1	1,841	4	481
21	W. A. Wheeler, No. 162	" "	2	1,485	1	1,704	4	1,189
22	No. 240	Medium "	1	1,240	1	184	2	1,424
23	No. 164	" "	1	1,000		1,380	2	380
24	No. 167	" "	1	610		1,920	2	530
25	Grimm (Lyman)	Strong "	2	640	1	1,024	3	1,664
26	Montana, No. 23454	Medium "	1	840		1,800	2	640
27	No. 25102	Strong "	2	500	1	960	3	1,460
28	Sand Lucerne	Medium "	1	660		1,200	1	1,860
29	Canadian (variegated)	" "	1	1,620		1,344	2	964
30	Canadian (purple flower)	" "	1	480		1,516	1	1,996
31	Turkestan	" "	1	1,720		1,800	2	1,520
32	Sanfoine, Spanish	" "	1	1,600		1,800	2	1,400
	Average		2	137	1	454	3	591

ALFALFA, sown in 1910.

Variety.	Remarks.	First Cutting.		Second Cutting.		Total.	
		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1. Turkestan	Medium growth	1	640		1,930	2	570
2. Grimm	" "	1	1,820	1	320	3	140
Average		1	1,230	1	125	2	1,355

CLOVER AND GRASSES.

The crop of hay from clover and grasses was less than the previous year, chiefly from June being a very dry month.

GRASSES AND RED CLOVER.

Variety.	Year Sown.	First Cutting.		Second Cutting.		Total.	
		Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
Brome grass	1905	1	640	..	..	1	640
Red Clover	1905	1	1,266	..	..	1	1,266
Red Clover	1910	1	520	..	1,380	1	1,900
Red Top	1908		1,546	..	..		1,546
English Blue grass	1908		1,506	..	..		1,506
Western Rye grass	1910	1	792	..	..	1	792

CANARY GRASS.

Canary grass was sown on fallowed land, one-fortieth acre plot, on May 15. The plot was cut on the 5th of August and used for exhibition purposes. The yield of straw was one and one-quarter tons per acre.

CULTIVATION OF GRASSES.

The cultivation for grasses that has given the best results, is to plough stubble land in the fall or spring, four or five inches deep, and sow the seed from the 20th to the last of May. When the land is ploughed in the fall, it should be disced or cultivated shallow before sowing, to kill the weeds that have germinated.

For hay, Western Rye grass, 12 pounds, and Timothy, 3 pounds, mixed and sown per acre, gives good returns. For pasture, Western Rye grass, 10 pounds, and English Blue grass, 6 pounds per acre is better.

A nurse crop should not be sown with the grass seed. Mow the crop close to the ground, about July 1, to keep weeds from going to seed. The crop can be pastured in the fall.

FXPERIMENTAL STATION, ROSTHERN, SASK.

REPORT OF THE SUPERINTENDENT—W. A. MUNRO, B.S.A.

FIELD ROOTS AND CORN.

Seed for field roots and corn was obtained from the A. E. McKenzie Co., Brandon, Man., and Steele, Briggs Seed Co., Winnipeg.

EXPERIMENTS WITH INDIAN CORN.

One two-acre plot of fodder corn yielded 30 tons 490 pounds, while ten plots of different varieties gave the following results. Yields are computed from weight of 2 rows, 78 feet long.

Number.	Name of Varieties.	Length.	Yield per Acre.	
		Inches.	Tons.	Lb.
1	Gehu	64	21	240
2	Eight-rowed Canada	80	19	280
3	Longfellow (Steele Briggs)	88	19	280
4	Minnesota King	86	18	960
5	Compton's Early	96	17	320
6	Longfellow (A. E. McKenzie)	84	16	340
7	Canada	73	16	340
8	North Dakota	78	14	1,040
9	North Dakota (White Flint)	86	13	1,060
10	G. P. S. K	80	10	1,780
	Average		16	1,264

TURNIPS.—Test of Varieties.

Number.	Name of Varieties.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Hall's Westbury	32	221	1,070	21
2	Green Top	31	1,104	1,051	44
3	Yellow Aberdeen (Green Top)	31	323	1,038	43
4	Cowhorn	30	591	1,009	51
5	Selected White Globe	29	78	967	58
6	Yellow Aberdeen (Purple Top)	29	78	967	58
7	White	27	1,845	930	45
8	Hartley's Bronze Top	25	818	846	58
9	Imperial	24	1,143	819	3
10	Kangaroo	24	26	800	26
11	Elephant	22	676	744	36
	Average	27	1,900	931	40

MANGELS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Prize Mammoth....	30	1,987	1,033	7
3	Yellow Globe....	28	515	908	35
3	Giant Yellow Oval....	26	1,164	886	4
4	Mammoth Long Red....	23	1,021	783	41
5	Giant Yellow Globe....	22	229	737	9
6	Golden Tankard, (A. E. McKenzie)....	20	766	679	26
7	Golden Tankard (Steele Briggs)....	14	1,039	483	59
8	Manitoba Giant Yellow....	9	1,545	325	45
	Average....	22	33	733	53

CARROTS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Guerande or Ox Heart....	13	805	446	45
2	Large White Belgian....	11	1,454	390	54
3	Improved Short White....	10	1,042	350	42
4	Long Red Surrey....	9	428	307	8
5	Long Orange....	8	1,423	290	23
6	Long White Belgian....	8	753	279	13
7	Giant White Vosges....	7	1,078	251	18
8	Cooper's Yellow Intermediate....	7	500	241	40
9	Long Orange....	6	1,961	232	41
	Average....	9	605	310	5

KOHL RABI.—Test of Varieties.

No.	Variety.	Yield per Acre.	
		Tons.	Lb.
1	Early White Vienna....	22	117
2	Early Purple Vienna....	10	1,779
	Average....	16	948

SUGAR BEETS.—Test of Varieties.

No.	Variety.	Yield per Acre.			
		Tons.	Lb.	Bush.	Lb.
1	Royal Giant	34	354	1,139	14
2	Monarch	30	89	1,001	29
3	Danish Improved	25	818	846	58
4	Danish	24	585	809	45
5	Giant Half Sugar	23	1,579	792	59
6	Vilmorin's Improved B	21	1,560	726	00
7	" " A	20	766	679	26
8	Klein Wanzleben	18	880	614	40
9	" "	16	1,507	558	27
	Average	23	1,793	796	33

EXPERIMENTAL STATION, SCOTT, SASK.

REPORT OF THE SUPERINTENDENT—R. E. EVEREST, B.S.A.

EXPERIMENTS WITH INDIAN CORN.

Three varieties of corn were planted from May 29 to 31, in hills thirty inches apart each way, on land which had been summer-fallowed the previous year. Growth was slow, and at the time of the first frost, September 15, the crop was in a backward condition. On the 17th, the corn was cut and bound in sheaves. The quality was good, as shown by the relish with which it was consumed by stock, later in the season.

Indian Corn for Ensilage.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Cutting.	Condition when Cut.	Weight per Acre.	
					Tons.	Lb.
1	Longfellow	May 29	Sept. 17	Immature, frosted	11	1,430
2	Minnesota King	" 30	" 17	" "	11	1,100
3	Compton's Early	" 31	" 17	" "	7	1,108
	Average				10	746

EXPERIMENTS WITH FIELD ROOTS.

Turnips, mangels, sugar beets and carrots were sown on fallowed land. Frequent cultivation was given. The turnips made satisfactory growth throughout the season, most varieties producing a fine crop, excellent in shape and quality.

Turnips.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.		Yield per Acre.		Description of Variety.
				Tons.	Lb.	Bush.	Lb.	
1	Jumbo	May 30	Oct. 12	27	1,440	924	00	Good.
2	Perfection	" 29	" 12	27	1,242	920	42	Very good.
3	Good Luck	" 30	" 12	24	1,830	830	30	Good.
4	Hartley's Bronze Top	" 29	" 12	20	788	679	48	Green.
5	Canadian Gem	" 29	" 12	19	1,630	660	30	Very good.
6	Hall's Westbury	" 29	" 12	15	1,284	521	24	Rooty.
	Average			22	1,369	756	9	

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.		Yield per Acre.	
				Tons.	Lb.	Bush.	Lb.
1	Giant Yellow Globe	May 30	Oct. 14	10	1,120	352	00
2	Prize Mammoth Long Red	" 30	" 14	8	500	275	00
	Average			9	810	313	30

CARROTS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Pulling	Yield per Acre.		Yield per Acre.	
				Tons.	Lb.	Bush.	Lb.
1	Oxheart	May 31	Oct. 14	12	1,080	418	00
2	Improved Short White	" 31	" 14	11	1,760	396	00
3	Large White Belgian	" 31	" 14	7	1,180	253	00
	Average			10	1,340	355	40

SUGAR BEETS.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre.		Yield per Acre.	
				Tons.	Lb.	Bush.	Lb.
1	Klein's Wanzleben	May 30	Oct. 14	5	1,220	187	..
2	Vilmorin's Improved	" 31	" 14	2	1,280	83	..
	Average			4	250	137	30

EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

REPORT OF THE SUPERINTENDENT—W. H. FAIRFIELD, M.S.

PART I—NON-IRRIGATED OR 'DRY FARM.'

The season of 1912 resembled that of 1911 in that the rainfall during the early part was deficient, while during the latter part the usual amount was received.

The rainfall was very light indeed until the last few days in June; from then on, during July, August and September, it was above normal. On account of this light rainfall during the first part of the growing season, all early sown crops suffered acutely. Crops that looked extremely promising early in the season gave but low yields. Late-sown crops, on the other hand, did much better.

The yields of all the crops on the non-irrigated portion of the Station were rather low, with the exception of late-growing crops, such as turnips.

EXPERIMENTS WITH INDIAN CORN.

Five varieties of corn were planted May 11 on summer-fallowed land. Two rows of each variety were planted in hills and another two rows of each variety planted with the seed a few inches apart. All the plots were considerably damaged by wire worms. The size of the plots was one one-hundredth of an acre.

INDIAN CORN FOR ENSILAGE.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when Cut.	Weight per Acre Grown in Rows.		Weight per Acre Grown in Hills.	
				Ins.		Tons.	Lb.	Tons.	Lb.
1	Compton's Early (Commercial seed)..	May 11	Sept. 7	56	Tasselled, cobs forming.	8	1,800	6	300
2	North Western Dent..	" 11	" 7	60	Tasselled, a few matured cobs....	7	1,100	7	500
3	North Dakota........	" 11	" 7	59	Tasselled, cobs forming.	6	1,000	5	200
4	Longfellow..	" 11	" 7	58	" " .	6	700	5	500
5	Compton's Early (Ontario seed)..........	" 11	" 7	60	" " .	5	1,400	4	500
	Average.........	....	....	....	....	7		5	1,200

EXPERIMENTS WITH TURNIPS.

Nine varieties of turnips were sown on summer-fallowed land on April 20 and pulled on October 17. The size of the plots was one-seventieth of an acre.

One variety (Kangaroo) failed completely. Two varieties out of the eight remaining ones, viz., Mammoth Greystone and Golden Ball, were rather uneven, and their yield estimated from 1/132 acre.

TURNIPS.—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.		Yield per Acre.	
		Tons.	Lb.	Bush.	Lb.
1	Bangholm	28	1,610	960	10
2	Jumbo	23	760	779	20
3	Hartley's Bronze Top	23	690	778	10
4	Invicta	21	770	712	50
5	Mammoth Greystone	21	240	704	00
6	Hall's Westbury	17	160	569	20
7	Golden Ball	15	1,680	528	00
8	Halewood's Purple Top	15	1,080	518	00
	Average	20	1,624	693	44

EXPERIMENTS WITH MANGELS.

Six varieties of mangels were sown on summer-fallowed land in plots of one-hundredth of an acre in size. They were sown on April 20 and pulled September 26.

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Yield per Acre		Yield per Acre	
		Tons.	Lb.	Bush.	Lb.
1	Selected Yellow Globe	22	1,800	763	20
2	Giant Yellow Globe	22	800	746	40
3	Golden Tankard	21	1,900	731	40
4	Prize Mammoth Long Red	18	1,700	628	20
5	Giant Yellow Intermediate	17	1,600	593	20
6	Perfection Mammoth Long Red	17	600	576	40
	Average	20	400	673	20

EXPERIMENTS WITH CARROTS.

Four varieties of carrots were sown on summer-fallowed land in plots one hundred and fifth of an acre in size. They were sown April 20 and pulled October 14.

CARROTS.—Test of Varieties.

Number.	Name of Variety.	Yield per Acre First Sowing.		Yield per Acre First Sowing.	
		Tons.	Lb.	Bush.	Lb.
1	Improved Short White	10	1,262	354	22
2	White Belgian	8	275	271	15
3	Mammoth White Intermediate	6	175	202	55
4	Chantenay	4	1,712	161	52
	Average	7	856	247	36

EXPERIMENTS WITH SUGAR BEETS.

Five varieties of sugar beets were sown on summer-fallowed land and the yield was computed from two rows, 125 feet long. They were sown on May 16 and pulled October 14.

Number	Variety.	Yield per Acre.		Yield per Acre.	
		Tons	Lb.	Bush.	Lb.
1	Raymond 'B'	13	565	442	45
2	Vilmorin's Improved 'A'	13	228	437	08
3	Raymond 'A'	12	1,300	421	40
4	Klein Wanzleben	11	1,613	393	33
5	Vilmorin's Improved 'B'	10	999	349	59
	Average	12	541	409	1

Average specimens of the roots from each variety were sent to the Chemist of the Experimental Farms, Mr. Frank T. Shutt, for analysis, the results of which are given below:—

Number	Variety.	Sugar in Juice.	Solids in Juice.	Coefficient of Purity.
		Per cent.	Per cent.	Per cent.
1	Raymond 'B'	17·84	30·43	87·3
2	Vilmorin's Improved 'A'	17·26	20·69	83·4
3	Raymond 'A'	17·56	20·43	85·9
4	Klein Wanzleben	17·92	20·43	87·6
5	Vilmorin's Improved 'B'	17·83	20·63	86·9

ALFALFA.

The alfalfa on the non-irrigated land, except that planted in rows, was a practical failure. It did not get more than eight or ten inches high and was so short and fine that it was difficult to gather it with a horse rake after the cutting.

That planted in rows did better, although the plants appeared to be too thick in the rows except the fields in rotation 'F.' Most of the alfalfa planted in rows was allowed to ripen seed. Only a small piece was reserved for hay. This was cut on June 3, and yielded at the rate of 1 ton 1,522 pounds to the acre.

PART II.—THE IRRIGATED FARM.

On the irrigated portion of the Station, where water was applied in June, and in some cases even in May, the yields were much more satisfactory that on the non-irrigated Farm.

EXPERIMENTS WITH INDIAN CORN.

Five varieties of Indian corn were sown on land on which grain had been grown last year. They were all sown on May 10 and 11 in plots one-hundredth of an acre in size. They were irrigated twice, viz., on June 4 and August 7. They were all cut September 7.

Indian Corn for Ensilage.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when Cut.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
				Inches.		Tons	lb.	Tons	lb.
1	Compton's Early (Commercial seed)	May 10.	Sept. 7.	78	Tasselled, cobs forming	21	600	14	1,200
2	North Dakota	May 11.	Sept. 7.	76	Tasselled, some cobs forming	20	1,800	15	1,800
3	Compton's Early (Ontario seed)	May 10.	Sept. 7.	78	Tasselled, cobs forming	16	1,000	13	1,000
4	Northwestern Dent	May 10.	Sept. 7.	72	Tasselled, some good cobs	16	400	15	1,400
5	Longfellow	May 11.	Sept. 7.	80	Tasselled, cobs forming	12	300	14	
	Average					17	820	14	1,480

EXPERIMENTS WITH TURNIPS.

Eight varieties were tested. They were sown on May 7, and pulled on October 15. The crop received two irrigations, viz., on June 4 and August 7. The size of the plots was one hundredth of an acre.

Turnips.—Test of Varieties.

Number.	Name of Variety.	Yield per Acre		Yield per Acre	
		Tons.	Lb.	Bush.	Lb.
1	Early Milan	33	00	1,100	00
2	Mammoth Greystone	32	500	1,075	00
3	Invicta	24	1,000	816	40
4	Bangholm	22	00	733	20
5	Hartley's Bronze Top	21	1,000	716	40
6	Jumbo	19	1,000	650	00
7	Golden Ball	16	1,000	550	00
8	Hall's Westbury	14	1,000	483	20
	Average	22	1,938	765	38

EXPERIMENTS WITH MANGELS.

Six varieties of mangels were sown on land on which grain was grown last year. A very poor stand was obtained in all the plots. Two seedings were made, viz., one on April 20 and the other on May 10. They received two irrigations, viz., on June 4 and August 7. The plots were one hundredth of an acre in size. They were all pulled on September 26.

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Yield per Acre		Yield per Acre 1st Sowing.		Yield per Acre 2nd Sowing.		Yield per Acre 2nd Sowing.	
		Tons.	Lb.	Bush.	Lb.	Tons.	Lb.	Bush.	Lb.
1	Selected Yellow Globe..........	24	800	813	20	12	1,000	416	40
2	Giant Yellow Globe..............	15	1,000	516	40	11	00	366	40
3	Perfection Mammoth Long Red..	12	1,000	416	40	11	00	366	40
4	Golden Tankard.................	10	1,000	350	00	14	00	466	40
5	Giant Yellow Intermediate ..	10	1,000	350	00	11	1,000	383	20
6	Giant Mammoth Long Red......	8	1,000	283	20	7	00	233	20
	Average	13	1,300	455	00	11	333	372	13

EXPERIMENTS WITH CARROTS.

Four varieties of carrots were sown on land on which grain was grown last year. They were sown on April 20, in plots one hundredth of an acre in size. They received two irrigations on June 4 and August 7. They were pulled on October 14.

CARROTS.—Test of Varieties.

No.	Name of Variety.	Yield per Acre		Yield per Acre	
		Tons.	Lb.	Bush.	Lb.
1	White Belgian..	12		400	
2	Improved Short White	6		200	
3	Chantenay..........................	5	1,000	183	20
4	Mammoth White Intermediate..........	4	1,000	150	
	Average....................................	7	00	233	20

EXPERIMENTS WITH SUGAR BEETS.

Five varieties of sugar beets were sown on land on which grain was sown last year. They were sown on April 22, except Nos. 3 and 4, which were sown on May 16. The size of the plots was one hundredth of an acre. They received two irrigations, viz., on June 4 and August 7. They were all pulled on October 14.

No.	Variety.	Yield per Acre.		Yield per Acre.	
		Tons.	Lb.	Bush.	Lb.
1	Klein Wanzleben	17	500	575	
2	Raymond 'A'	16	1,000	550	
3	Vilmorin's Improved 'A'	16	900	548	20
4	Vilmorin's Improved 'B'	15	900	515	
5	Raymond 'B'	9	1,720	328	40
	Average	15	204	503	24

Average specimens of the roots from each variety were sent to the Chemist of the Experimental Farms, Mr. Frank T. Shutt, for analysis, the results of which are given below:—

No.	—	Sugar in Juice.	Solids in Juice.	Coefficient of Purity.
		p. c.	p. c.	p. c.
1	Klein Wanzleben	17·68	19·63	90·6
2	Raymond 'A'	15·84	19·00	83·3
3	Vilmorin's Improved 'A'	19·42	21·57	90·0
4	Vilmorin's Improved 'B'	17·85	20·03	84·9
5	Raymond 'B'	16·25	18·80	86·5

ALFALFA.

The dry weather during May and June reduced somewhat the first cutting of alfalfa. The unusual amount of rain during July and August, and the weather on account thereof being not as hot as usual, retarded the growth of the second and third cutting to a considerable extent. Consequently, the alfalfa fields did not produce as much as they ordinarily do. On account of the many showers during harvesting time the proper curing of the hay was also made difficult.

VARIETY TESTS.

In the spring of 1909, seed of fourteen varieties or strains of alfalfa were planted that were received from the United States Department of Agriculture, Washington, D.C. These were supplied by the courtesy of Mr. J. M. Westgate, Agronomist Division of Forage Crop Investigations. The following table gives the results for the past season. The first cutting was made June 20, the second August 5, and the third September 17.

Size of Plot.	Name and Number.	First Cutting. Yield per Acre.		Second Cutting. Yield per Acre.		Third Cutting. Yield per Acre.		Total Yield per Acre.	
Acres.		Tons	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
1-40	22,790 From Kiva, Turkestan..	3	1,200	2	160		1,600	6	960
1-10	24,837 Canadian (variegated)...	2	1,450	2	700	1	250	6	400
1-10	23,454 Montana	2	1,700	2	100	1	550	6	350
1-10	From Ottawa (Turkestan)......	3	550	2	250		1,500	6	300
1-10	24,859 Kansas Hardy....	2	1,300	2	300	1	650	6	250
1-40	22,788 From Aulie-ata, Turkestan	3	400	2	480		1,200	6	80
1-10	23,394 Sand Lucerne	2	1,200	1	1,800	1	700	5	1,700
1-40	23,203 From Wernyj Turkestan	2	1,400	2	160	1		5	1,560
1-10	21,032 Turkestan..............	2	1,500	2	50		1,900	5	1,450
1-10	25,102 Grimm.................	2	1,000	2	200	1	150	5	1,350
1-10	24,836 Canadian (purple flower)	2	1,200	2	150		1,850	5	1,200
1-10	23,396 Sand Lucerne .	2	850	1	1,650	1	500	5	1,000
1-40	25,022 Old Frankish Lucerne..	2	1,600	2	400		800	5	800
1-40	22,789 From Tschimkent, Turkestan	2	1,400	1	1,520		1,200	5	120
	Average..............	2	1,625	2	137		1,918	5	1,680

In addition to the above variety tests the yield of two alfalfa fields may be given. A field of 1·91 acres, seeded in 1909, yielded as follows:—

Date Cut.	Yield per Acre.	
	Tons.	Lb.
First cutting, June 20....................................	2	1,435
Second cutting, August 5	2	395
Third cutting, September 17..............................	1	100
Total...	5	1,930

An irregular field of 5.58 acres gave three cuttings and yielded as follows:—

Date Cut.	Yield per Acre.	
	Tons.	Lb.
First cutting, June 28....................................	2	1,148
Second cutting, August 14.	1	1,713
Third cutting, September 17	..	1,802
Total......	5	663

DISCING EXPERIMENT.

An experiment was carried on with discing alfalfa on the irrigated land. The piece of alfalfa land used was sown in the spring of 1908. The first cutting was made June 28, the second August 8, and the third September 17.

—	Area.	Yield per Acre. First Cutting.		Yield per Acre. Second Cutting.		Yield per Acre. Third Cutting.		Total Yield per Acre.	
	Acres.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
Not disced..........	·275	·2	1,091	2	60	1	454	5	1,545
Double-disced twice on Ap'l 11	·32	2	813	1	1,688	0	1,984	5	485
Double-disced on April 11....	·35	2	1,114	1	1,900	1	343	5	1,357

The above table would seem to indicate that no results are gained from discing alfalfa.

RATES OF SEED PER ACRE.

The following fields were sown in the spring of 1911 on land on which grain was grown the year previous. They were irrigated once on June 13. Only two cuttings were made, viz., the first on July 3 and the second on August 15. Size of plots, ½ acre.

Rate per Acre.	First Cutting. Yield per Acre.		Second Cutting. Yield per Acre.		Total Yield per Acre.	
Lb.	Tons.	Lb.	Tons.	Lb.	Tons.	Lb.
5	1	780	1	60	2	840
10	1	990	1	90	2	1,080
15	1	1,010	1	350	2	1,360
20	1	1,130	1	550	2	1,680
25	1	1,100	1	600	2	1,900

GRASSES AND MIXTURES.

A plot of one-quarter acre of Timothy was cut July 18, and yielded at the rate of 1 ton 1,400 pounds per acre. A plot of one-half acre of Brome grass was cut July 18, and yielded at the rate of 3 tons 30 pounds per acre. A plot of one-half acre of Western Rye grass, cut July 18, yielded at the rate of 1 ton 1,400 pounds per acre. A plot of ·92 acres of Clover and Timothy mixed, gave two cuttings, one on July 15 and the other September 16, the two cuttings giving a yield at the rate of 3 tons 1,413 pounds per acre.

IRRIGATION OF HAY.

It has been found that to get the best returns with hay under irrigation it should be irrigated thoroughly in the fall. The advantage of fall irrigation is that the land is in a moist condition in the spring, which gives the hay a good, vigorous start quite early; and if the water is not turned into the ditches until rather late in the season, as is often the case, the crop does not receive as serious a check as would otherwise be the case.

The advantage of fall irrigation applies to alfalfa, and still more particularly to the grasses. With fall irrigation a deep-rooted crop, like alfalfa, will, in an ordinary season, give a maximum yield at the first cutting without again being irrigated in the spring, but with such shallow-rooted crops as Timothy and Brome grass, etc., it is necessary to irrigate in May, and often two or three times before cutting time.

EXPERIMENTAL STATION, LACOMBE, ALTA.

REPORT OF THE SUPERINTENDENT—G. H. HUTTON, B.S.A.

EXPERIMENTS WITH INDIAN CORN.

The results of the test of varieties of Indian corn were unsatisfactory, and yields per acre were quite low. The heavy precipitation delayed growth, and no variety got much more than well tasselled. Seed was planted in hills, two and one-half feet apart each way, on May 24. The crop was cut on August 31. The land was ploughed out of sod in August, 1911, thoroughly fall worked and cultivated again in the spring, previous to planting time.

Indian Corn for Ensilage.—Test of Varieties.

Number.	Name of Variety.	Average Height.	Weight per Acre.	
		Inches.	Tons.	Lb
1	Canada Eight-row	59	8	236
2	Compton's Early	62	6	1,200
3	Longfellow (Steele Briggs)	51	6	1,200
4	North Dakota (Rennie)	52	6	1,200
5	Longfellow (Rennie)	55	5	1,880
6	North Dakota (McKenzie)	50	5	1,616
7	Longfellow (McKenzie)	53	5	560
8	North-western Dent	42	2	1,016
	Average	......	5	1,864

EXPERIMENTS WITH FIELD ROOTS.

The results of experiments with turnips, mangels and sugar beets, for the season of 1912, are far from satisfactory. The mangel and sugar beet crop was a failure. The yield of turnips and carrots is extremely small.

Turnips.—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.		Yield per Acre.	
		Tons.	Lb.	Bush.	Lb.
1	Rennie's Prize	6	210	203	30
2	Derby	5	1,946	199	6
3	Bangholm	5	857	180	57
4	N. W. Purple Top	4	1,570	159	30
5	Imperial	4	778	146	18
6	Perfection	4	250	120	40
7	Jumbo	2	26	67	6
	Average	4	1,377	153	52

CARROTS.—Test of Varieties.

Number.	Variety.	Yield per Acre		Yield per Acre	
		Tons.	Lb.	Bush.	Lb.
1	Improved Mammoth	9	348	305	48
2	Mammoth Short White	8	1,160	286	00
3	White Vosges	8	962	282	42
6	Cooper's Intermediate	7	1,774	262	54
5	Oxheart	7	1,543	259	3
4	Improved Short White	7	1,246	254	6
	Average	8	506	275	6

EXPERIMENTS WITH ALFALFA.

In May, 1911, five varieties of alfalfa were seeded on land ploughed out of stubble and freely cultivated until the latter part of the month. These plots were only one one-hundred and twentieth of an acre in size, but since they were in one block, the yield can fairly be taken as but slightly greater than would have been secured from field areas. The same varieties were also sown in rows, forty-two inches apart.

Number.	Variety.	Yield of Hay per Acre sown in rows 42 inches apart.		Yield per Acre broadcasted in plots.	
		Tons.	Lb.	Tons.	Lb.
1	Twentieth Century		1,697	2	200
2	Grimm (Minnesota)	2	525	2	1,660
3	Sand Lucerne		1,980	1	1,360
4	Hungarian	1	829	1	1.360
5	Grimm (Washington)	2	526	1	1,120

EXPERIMENTAL FARM, AGASSIZ, B.C.

REPORT OF THE SUPERINTENDENT—P. H. MOORE, B.S.A.

HOED CROPS.

During the season of 1912, tests of the following varieties of hoed crops were carried on at this Farm: Ensilage corn, eight varieties; turnips, ten varieties; mangels, nine varieties; carrots, five varieties; sugar beets, three varieties.

All of this material was planted on a pasture field which had been ploughed early the previous fall, worked occasionally to kill the weeds, ploughed deeper late in the fall and then manured during the late winter and spring with a light coat of about sixteen tons of barnyard manure.

Although all varieties are on comparable land this year, they do not compare with the results obtained in 1911, as they were on decidedly different land and had different treatment. A short note will be given with regard to the cultivation methods of each class of crop under the following headings:—

ENSILAGE CORN.

Six varieties of Indian corn and two varieties of Kafir corn were grown for ensilage. They were planted on land treated as that for the rest of the hoed crops, only no commercial fertilizer was added. The Longfellow, although not the heaviest yielder, gave us the best all round ensilage results.

Number.	Variety.	Planted.	Cutting Date.	Average Height.	Condition when Cut	Weight per Acre.	
				Inches.		Tons.	Lb.
1	Angel of Midnight	May 27	Sept. 26	96	Glazed	17	320
2	Leaming	" 27	" 26	89	Milk stage	16	1,220
3	Compton's Early	" 27	" 26	92	Uneven roasting stage	15	1,240
4	Wood's Northern Dent	" 27	" 26	84	No ears	15	140
5	Longfellow	" 27	" 26	86	Roasting stage	14	600
6	Early Mastodon	" 27	" 26	102	No ears	11	1,436
7	Kafir Corn	" 27	" 26	52	Some seed	5	670
8	Kafir Corn (perennial)	" 27	" 26	42	No heads	4	1,790
	Average of the 6 first varieties					15	159

TURNIPS.

The turnips were grown on the same sort of land as mangels, and with the same methods of cultivation, as near as could be applied, with the exception of not receiving any commercial fertilizer. In the under-noted table it will be seen that the Hall's Westbury is mentioned as being the heaviest yielder, but this is partly accounted for by having about two hundred pounds of commercial fertilizer added to the plot, and this does not make it comparable with other varieties.

Number.	Variety.	Yield per Acre. — 1st sowing.		Yield per Acre. — 2nd sowing.		Size of Plot.
		Tons.	Lb.	Tons.	Lb.	
1	Hall's Westbury	56	728	42	1,536	1/132 acre
2	Halewood's Bronze Top	31	40	34	640	"
3	Bangholm	26	8	20	1,184	"
4	Mammoth Clyde	24	972	19	1,864	"
5	Hartley's Bronze Top	21	1,428	19	1,732	"
6	Elephant	20	1,448	17	1,640	"
7	Good Luck	21	1,428	18	1,224	"
8	Jumbo	16	1,264	15	1,944	"
9	Perfection	17	1,640	1[illegible]	[illegible],752	"
10	Magnum Bonum	15	1,416	17	1,112	"
	Average of the last 9 varieties	21	1,516	20	788	

MANGELS.

The mangels were planted on ridges; the first crop was sown on May 6 and the second on May 20. Three hundred and fifty pounds of 'B' fertilizer (Victoria Chemical Co.) was used per acre, and was sown in the drills as they were set up. Ten pounds of seed was used per acre. The mangels were cultivated with a single horse scuffler about the time they appeared above the ground, and this was continued until they were ready for thinning. They were hoed once by hand, and thinned, then hoed once by hand afterwards; the rest of the cultivation was done by horses until the crop began to close over the rows. It will be noted in the following table that the Selected Yellow Globe gave the largest yield, although not the most profitable crop, as they had to be left closer together in the rows and the roots were harder to handle.

The following table gives the results of the different plots; they were all pulled on November 5:—

Number.	Variety.	Yield per Acre. 1st Sowing.		Yield per Acre. 2nd Sowing.		Size of Plot.
		Tons.	Lb.	Tons.	Lb.	
1	Selected Yellow Globe	30	192	26	1,328	1/132 acre.
2	Giant Yellow Intermediate	28	1,024	30	1,904	1/132 "
3	Giant Yellow Globe	27	1,440	26	800	1/132 "
4	Yellow Intermediate	27	912	24	1,632	1/132 "
5	Giant Half Sugar White	23	1,520	22	1,936	1/132 "
6	Gate Post	21	108	15	604	1/132 "
7	Mammoth Yellow Intermediate	20	1,712	16	736	1/132 "
8	Perfection Mammoth Long Red	20	1,184	19	1,732	1/132 "
9	Prize Mammoth Long Red	17	1,901	22	1,936	1/132 "
	Average	24	444	22	1,845	

Four fertilizer experiments were also carried on with the Giant Half Sugar White, results of which will be shown in the following table. The fertilizer was supplied by the German Potash Syndicate. The land on which this fertilizer was used was treated in exactly the same manner as described above for the planting of the other mangels. It was a very comparable piece of soil, and the plots were handled

alike throughout the season with the exception of the check plot, which had to have an extra hoeing. Plot No. 1 received no commercial fertilizer at all, but had a dressing of sixteen tons of barnyard manure. Plot No. 2, in addition to the manure, had two hundred pounds of muriate of potash, one hundred and forty pounds of nitrate of soda and four hundred pounds of superphosphate applied per acre. Plot No. 3 had one hundred and forty pounds of nitrate of soda and four hundred pounds of superphosphate per acre.

Plot Number.	Planted.	Harvested.	Yield per Acre.	
			Tons.	Lb.
1 (check)	May 6	Nov. 5	20	640
2	" 6	" 5	32	1,000
3	" 6	" 5	28	1,240

CARROTS.

Of the five varieties sown, the Improved Short White has this season given the best results as it did last year under a similar treatment on very different soil. Following are the tabulated results:—

Number.	Variety.	Yield per Acre. 1st Sowing.		Yield per Acre. 2nd Sowing.		Size of Plot.
		Tons.	Lb.	Tons.	Lb.	
1	Improved Short White	26	1,064	24	1,236	1/132 acre
2	Mammoth Intermediate (White)	25	952	20	1,448	1/132 "
3	White Belgian	22	1,672	20	656	1/132 "
4	Ontario Champion	21	108	19	1,996	1/132 "
5	Half Long Chantenay	13	1,984	13	532	1/132 "
	Average	21	1,956	19	1,574	

SUGAR BEETS.

The same cultivation methods were used with the sugar beets as with the mangels, with the following results:—

Number.	Variety.	Yield per Acre. 1st Sowing.		Yield per Acre. 2nd Sowing.		Size of Plot.
		Tons.	Lb.	Tons.	Lb.	
1	Klein Wanzleben	16	1,264	16	736	1/132 acre
2	French Very Rich	15	96	14	512	1/132 "
3	Vilmorin's Improved "B"	14	512			
4	Vilmorin's Improved "A"	13	664			
	Average	14	1,634	14	1,624	

The result of the analysis of the sugar beets, which was made by Frank T. Shutt, Dominion Chemist, is reported on as follows:—

—	Sown May 6.	Vilmorin's Improved. "A"	Vilmorin's Improved. "B"	Klein. Wanzleben.	French Very Rich.
	Lb. Oz.	Lb. Oz.	Lb. Oz.	Lb. Oz.	Lb. Oz.
Average weight of 1 root	1 4	1 6	1 7	1 8	1 5
Sugar in juice, per cent......	17·91	18·18	17·03	19 40	15·51
Solids in juice, per cent......	19·40	18·60	18·09	20·40	17·15
Coefficient of purity	92·3	97·7	95·1	95·1	90·4

'Both as regards richness and purity, these beets would be considered very satisfactory for factory purposes. The French Very Rich has given a good average, the three samples of Vilmorin's Improved are of decidedly superior quality, and Wanzleben data are of the highest order.'—F. T. Shutt.

SUBSTATION.

FORT VERMILION, ALBERTA.

Indian Corn for Ensilage.—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when Cut.	Weight per Acre grown in rows.
				Inches.		Tons.
1	Longfellow..........................	May 2..	Sept. 6.	34	Not tasseled..........	6
2	Longfellow, Red Nose..............	" 2..	" 6.	44	In tassel Aug. 30, no silk	12

Turnips.—Test of Varieties.

Number.	Name of Variety.	Sown.	Pulled.	Yield per Acre.	Description of Variety.
				Tons. Lb.	
1	Good Luck............................	May 9......	Sept. 20....	21 1,200	Fine and large.
2	Perfection Swede	" 9......	" 20....	21 1,440	Large.
3	Magnum Bonum.	" 9 .. .	" 20....	19 400	Medium.
4	Hartley's Bronze........................	" 9......	" 20....	16 1,600	Small.

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Sown.	Pulled	Yield per Acre. Tons.	Lb.	Description of Variety.
1	Prize Mammoth Long Red	May 7	Aug. 31	14	800	Medium size.
2	Giant Yellow Intermediate	" 7	" 31	10	1,600	Small.
3	Giant Yellow Globe	" 7	" 31	16	1,600	Large.
4	Gate Post	" 7	" 31	24	00	Very large.

CARROTS.—Test of Varieties.

Number.	Name of Variety.	Sown.	Pulled.	Yield per Acre. Tons.	Lb.	Description of Variety.
1	Ontario Champion	May 9	Sept. 16	11	500	Medium size.
2	White Belgian	" 9	" 16	8	20	Small size.
3	M. W. Intermediate	" 9	" 16	11	500	Medium.
4	Chantenay Half Long	" 9	" 16	7	1,780	Small.

SUGAR BEETS.—Test of Varieties.

Number.	Name of Variety.	Sown.	Pulled.	Yield per Acre. Tons.	Lb.	Description of Variety.
1	Klein Wanzleben	May 7	Sept. 18	8	800	Small size.
2	Vilmorin's Improved	" 7	" 15	9	1,200	Medium size.
3	French Very Rich	" 7	" 18	18	00	Large size.

EXPERIMENTS WITH GRASSES.

Timothy, sown 1910, was very short, and yielded 1½ tons to the acre.

Brome grass, plots sown 1910 and 1911, respectively, were very good. The yield was 2½ tons to the acre.

On May 4, 1912, small plots of the following grasses were sown, viz., Timothy, Tall Fescue, Western Rye grass, and Awnless Brome grass. At the close of the season they were all very poor, on account of the drought in the early spring.

On May 10, 1912, one-thirtieth of an acre was seeded to Canary grass. This was cut on September 6, and yielded four tons to the acre.

On June 6 a small plot was sown with Sainfoin. It produced a strong growth, standing about two feet high when cut on September 6.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE.
DOMINION EXPERIMENTAL FARMS

REPORT

FROM

THE POULTRY DIVISION

For the Year ending March 31, 1913

PREPARED BY

The Assistant Dominion Poultry Husbandman, Ottawa. - - - - - - - Victor Fortier.
Superintendent, Experimental Station, Lacombe, Alta. - - - - - - - - G. H. Hutton, B.S.A.
Superintendent, Experimental Farm, Agassiz, B.C. - - - - - - - - - - - P. H. Moore, B.S.A.

and including articles on

The Preservation of Eggs, by Frank T. Shutt, M.A., Dominion Chemist.
Black-Head in Turkeys (Entero-Hepatitis) and Tuberculosis in Fowls, by C. H. Higgins, B.S., D.V.S., Chief Pathologist, Health of Animals Branch.

NOTE.

Owing to the illness of the Poultry Manager, Mr. A. G. Gilbert, during a great part of the year, he was unable to plan and supervise many of the lines of experimental work which otherwise would have been taken up.

The report of the Poultry Division, which follows, is therefore brief. It has been prepared, for the most part, by Mr. Victor Fortier, Assistant Poultry Manager, and Mr. Walter Scott, foreman, Poultry Division.

Photo by Frank T. Shutt.

The open-front House that gave so much Better Results with Cotton. Note the 15″ Board to protect the Hens from Draughts.

REPORT FROM THE POULTRY DIVISION.

Year by year the poultry branch of farm work is becoming more valuable to the farmers of the country and this, too frequently, in the face of indifference which is not displayed in other departments of the farm. In previous reports it has been clearly shown that, with judicious management and treatment of the stock—which includes the sale of eggs and chickens at the proper seasons of the year—each hen should make a profit of one dollar to one dollar and fifty cents per year, over and above the cost of feed and management. Indeed many farmers who successfully manage flocks of fowl clear a much larger margin of profit.

Some farmers keep the light breeds and depend upon eggs alone for the profit, while others prefer a general-purpose breed, thinking that what they may lack in eggs is more than made up in table poultry. It is quite possible that in the milder portions of Canada, such as southern Ontario and the Pacific coast, the egg breeds may be most satisfactory, but in the colder portions of Canada, and, in this, Ottawa is included, the greater profit may be attained by the combined production of both eggs and meat, the latter in the shape of broilers and roasters. For this dual purpose, one of the utility breeds is to be preferred.

The question may be asked, 'Can we have a really good layer and flesh former combined?' And the query is warranted, for hitherto there has been an opinion on the part of many persons that it is necessary to have one of the Mediterranean varieties for layers and a larger fowl for a flesh-maker. This opinion has resulted in much of the confusion we find in the poultry business throughout the country to-day. A common but mistaken practice has been to mate a large male bird, one of the utility varieties, with small fowls, already very much mixed, with the object of increasing the size of the progeny, and improving their laying qualities. But such a procedure has only made matters worse, and was only a compromise at best. There are far too many mixed or nondescript fowls throughout the country, which fact seriously militates against the interests of the farmers.

The unsuitability of type and lack of finish of much of the poultry marketed in Canada has been commented on frequently by some of the largest buyers.

It is a matter of very great importance, then, that our farmers should breed chickens of the correct type, and still more important to them if they can have in their fowls good layers and market types combined.

What, then, is the best variety for farmers to breed to-day? The question is frequently asked, 'Can we have a good layer and market type combined?' Undoubtedly. Take, for instance, Barred Plymouth Rocks. If we select and breed only from good layers and flesh types, we are likely to have birds of the same excellent description and this is said with no intent to belittle the great Mediterranean class.

Briefly summed up, the following varieties are recommended to the farmers of the country as best to breed:—If both eggs and flesh are desired: Plymouth Rocks, Wyandottes, Rhode Island Reds and Orpingtons. If eggs alone: The Mediterranean class, of which the White Leghorns are the most popular.

PROPER TREATMENT TO SECURE EGGS AND FLESH.

It is of paramount importance that, having first secured the proper type of chickens, whether for eggs alone, or flesh and eggs combined, they should be care-

fully fed and cared for from the time of hatching until they reach the saleable age of two and one-half, three, or four months. The practice, too common among farmers, of allowing their chickens to 'pick up their own living' cannot be too strongly condemned. True, there is on many farms feed wasted that could with profit be converted into eggs and flesh and, in some cases, all that growing chicks require is to be allowed this feed that would otherwise be lost, but care should be taken that, if plenty of food is not available, it is provided if best results are looked for. It is the production of the highest quality that should be aimed at, and the best quality cannot be produced but by the greatest care and attention. As a result, the highest quality in poultry will always command a high price. There is, unfortunately, always plenty of the second and third grades to suit those who prefer such to the higher quality. The chicken that reaches four pounds in three months is a very different article to the 'scraggy, lean and bony specimen' that has been allowed 'to pick up its own living.'

And in eggs, equal care and attention are necessary. A good market now prevails, all the year round, for strictly new-laid, non-fertilized eggs, laid by well and cleanly fed and lice-free hens. Fowls should be free from lice both day and night. When the expression 'both day and night' is used, it means that the poultry house should be entirely free from red mites, which hide away in the cracks and crevices of the house during the day and come out in countless thousands at night to suck the life blood of the hens.

A dust bath, into which a little dry sulphur or tobacco dust has been mixed, will usually keep healthy hens free of body lice, but nothing but absolute cleanliness, with an occasional spray, will keep the red mites out. When once allowed to get into a hen house, their eradication is extremely difficult, and most thorough means have to be employed.

HOW TO CLEAN AND DISINFECT A POULTRY HOUSE.

The best description of how to clean poultry houses that we have seen is given by Dr. Raymond Pearl, University of Maine, in 'Poultry Diseases and their Treatment;' we should add to this, however, that where a hose is not available a good stiff broom might take its place.

Cleanliness.—The thing of paramount importance in the hygienic housing of poultry is cleanliness. By this is meant not merely plain ordinary cleaning up, in the housewife sense, but also bacteriological cleaning up; that is, *disinfection.* All buildings or structures of whatever kind in which poultry are housed during any part of their lives should be subjected to a most thorough and searching cleaning and disinfecting at least once every year. This cleaning-up should, naturally, come for each different structure *(i.e.,* laying, colony or brooder house, individual brooder, incubator, etc.) at a time which just precedes the putting of new stock into this structure.

Not every poultryman, of experience even, knows how really to clean-up a poultry house. The first thing to do is to remove all the litter and loose dirt which can be shovelled out. Then give the house—floor, walls and ceiling—a thorough sweeping and shovel out the accumulated debris. Then play a garden hose, with the maximum water pressure which can be obtained, upon floor, roosting boards, walls and ceiling, until all the dirt which washes down easily is disposed of. Then take a heavy hoe or roost board scraper and proceed to scrape the floor and roosting boards clean of the trampled and caked droppings and dirt. Then shovel out what has been accumulated and get the hose into action once more and wash the whole place down again thoroughly and follow this with another scraping. With a stiff-bristled broom thoroughly scrub walls, floors, nest boxes, roost boards, etc. Then, after another

rinsing down and cleaning out of accumulated dirt, let the house dry out for a day or two. Then make a searching inspection to see if any dirt can be discovered. If so apply the appropriate treatment as outlined above. If, however, everything appears to be clean, the time has come to make it really clean by disinfection. To do this it is necessary to spray or thoroughly wash with a scrub brush, wet in the solution used, all parts of the house, with a good disinfectant, at least twice, allowing time between for it to dry. For this purpose three per cent creosol solution is recommended. The chief thing is to use an effective disinfectant, and plenty of it, and apply it at least twice. To complete the cleaning of the house, after the second spraying of disinfectant is dry, apply a liquid lice-killer (made by putting one part crude carbolic acid or creosol with three parts kerosene) liberally to nests and roosts and nearby walls. After all this is done the house will be clean. With houses cleaned annually in this way, the first step has been taken towards hygienic poultry-keeping.

The same principles which have been here brought out should be applied in cleaning brooders, brooder houses, and other things on the plant with which the birds come in contact.

What has been said has reference primarily to the annual or semi-annual cleaning. It should not be understood by this that no cleaning is to be done at any other time. On the contrary, the rule should be to keep the poultry house clean at all times, never allowing filth of any kind to accumulate and using plenty of disinfectant.

THE OVER-PRODUCTION BUGBEAR.

There is little danger of over-production of the higher quality of poultry and eggs. Up to the present time, in the face of increased production, in all parts of the Dominion, and decreased export, there has been increased prices, thus showing the rapidly increasing value of the home market. As a matter of fact, Canada has, for the past two years, imported many hundreds of thousands of eggs, and this should not be in a country where conditions are particularly favourable to the production of the higher quality of poultry and eggs. There should be no alarm felt as to over-production.

SOME PRACTICES TO BE AVOIDED.

There are, however, practices on the part of many farmers which should be avoided if they ever intend to successfully cater to the high-quality trade. Some of the most common and injurious of these are noted as follows:—

1. Keeping eggs until a sufficient quantity is collected 'to make it worth taking to market.' Meanwhile the eggs become stale and the purchaser, knowing this, offers a second-rate price.

2. The reprehensible practice on the part of too many farmers of keeping their laying stock in ill-constructed and unsanitary poultry houses. Very frequently both hens and houses are lice-infested or contain disease germs. A suitable poultry house should be cheaply and conveniently constructed. Plans will gladly be furnished on application to the Poultry Division of the Central Experimental Farm.

3. A lack of variety in the composition of the daily ration, which leads to egg-eating or to eggs being laid with soft shells or no shells at all; also to feather-eating. Overcrowding of the poultry house is also an incentive to the vices named.

4. The too common practice of hatching out chickens late in the season. As a result, the pullets, instead of laying in October or early November, are non-productive during the winter season of high prices.

5. The practice of allowing male birds to run with the flock the whole year, thereby having none but fertile eggs; this fact alone causes a large annual loss from decayed and spoiled eggs.

6. Every person, which means no person, responsible for the poultry. Far better give to one of the boys or one of the girls the management of the poultry plant. Some one person should be responsible; this would mean a better-kept plant and more revenue. Try it.

EXPERIMENTS.

OPEN *versus* COTTON FRONT.

In the 1912 report, page 216, appears a photograph of an open-front poultry house which was being tried at the Central Experimental Farm. This house has a double roof, the lower part of which is to the front. The open space was 3 feet 4 inches high, and took in the whole front of the house. This open condition proved too cold for the Ottawa climate, so the front of one pen was covered with cotton on the first of February, 1913. The result, as shown in the following table, was that the pen with the cotton front had a considerably higher temperature and a better egg yield. Further improvements have been made to this house for this year, as will be seen in the cut, page 680 of this report. A 15-inch board has been placed along the floor, leaving about two feet opening over which cotton screens are hung. This board shows in the picture; also the cotton screens, several of which are down.

The hens in these pens were Barred Plymouth Rocks of the same strain and as evenly selected as possible. Pen 33, open front, was the east end of the house, and pen 36 the west end. Both pens had a large window towards the end, as shown in photograph. The ration fed in each pen was the same, and consisted of whole grain (wheat, oats and cracked corn) thrown in the litter in the morning and evening. Bone and beets were fed on alternate days at noon. After April the bone was replaced by meat scraps. Dry mash, consisting of equal parts gluten meal, shorts, ground oats and 10 per cent charcoal, was constantly before them, as was also grit and shell.

TABLE showing average temperature and egg yield from cotton and open-front pens.

Style of Front.	Pen Number.	Number of eggs laid per month.								Total eggs laid during 9 months.	Average temperature 13th Feb. to 13th Mar.
		1912.		1913.							
		Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.		
Open....	33	5	35	88	145	293	300	155	97	1,118	14·45
Cotton.	36	19	38	75	241	360	335	168	61	1,297	29·72

The minimum temperature registered during February and March was 20 below zero.

The minimum temperature of cotton front pen No. 36 was 6 degrees above.

The minimum temperature of open front pen No. 33, 10 degrees below.

EXPERIMENT ON FORCED MOULTING BY REDUCTION OF RATION.

On July 1, 28 White Leghorn hens were selected and divided into two even pens of 14 birds, numbered pen 3 and pen 4.

Pen 3 hereafter called 'starved' pen.

Pen 4 hereafter called 'fed' pen.

The method attempted to force the moult on pen 3 by reducing the ration:—

July 1 to 7 inclusive, full ration reduced 25 per cent or to three-fourths the usual quantity of feed required by 14 hens.

July 8 to 10, inclusive, ration reduced to one-half the amount of feed required by 14 hens.

July 11 to 13, inclusive, ration reduced 75 per cent, *i.e.,* the pen only received one-fourth of the usual quantity required by 14 hens.

July 14 to 15, inclusive, starved. No feed of any kind, but plenty of fresh clean water kept before the birds all the time.

July 16 to 18, inclusive, one-fourth of the usual quantity fed to 14 hens.

July 19 to 21, inclusive one-half of the usual quantity fed to 14 hens.

July 22 to 27, inclusive, three-fourths of the usual quantity fed to 14 hens.

July 28, full ration, same as pen 4.

TABLE showing quantity fed Pen 3 during reduced ration period.

Date.	Morning.	Noon.	Evening.
June 30	16 oz. oats or barley	28 oz. mash	24 oz. wheat
July 1–7	12 " " "	21 " "	18 " "
" 8–10	8 " " "	14 " "	12 " "
" 11–13	4 " " "	7 " "	6 " "
" 14–15	Nil	Nil	Nil
" 16–18	4 " oats or barley	7 oz. mash	6 oz. wheat
" 19–21	8 " " "	14 " "	12 " "
" 22–27	12 " " "	21 " "	18 " "
" 28	16 " " "	Hopper	24 " "

On reaching the 'full ration' period, pen 3 received the same quantity of whole grain, night and morning, as pen 4 had been fed all along, and were also given dry mash in hopper kept open all the time.

Hoppers contained dry mash composed of one part shorts, one part ground barley, one part gluten meal, 10 per cent charcoal, 10 per cent beef scraps; grit and oyster shells in proportion of two parts shell to one part grit.

Fresh clean water before both pens always.

Table showing falling off and advance in number of eggs laid by hens in 'starved' and 'fed' pens, before and after forced moulting:—

Month.	Starved.	Fed.
June	154	146
July	43	58
August	54	36
September	90	21
October	16	3
November	20	0
December	54	25
January	43	57
February	69	65
Total	543	411

The effect of the restricted ration on pen 3 was to entirely stop the egg yield by July 15, but the recovery from the moult was more rapid than in the instance of pen 4 and, consequently, the greater number of eggs were secured in the early fall, or the months of limited supplies.

Towards the end of the starvation period, or about July 25, the starved pen showed distinctly by the appearance of the birds and the number of moulted feathers in the pen and runs, that the method of forcing the moult by reduced ration and starvation had been successful.

It was also noted that about two weeks after the 'starved' pen had returned to full ration the hens were still ravenous for their feed, and cleaned it up quicker than those hens in 'fed' pen.

This was no doubt due to the fact that they were ahead of 'fed' pen in process of moulting and growing new feathers.

By August 29 fifty per cent of the hens in the 'starved' pen were again laying. Only 14·4 per cent in 'fed' pen were laying.

This experiment was discontinued after the months that high prices prevailed, as the pens were needed for other work.

The result shows a fair increase, and it is intended to carry on the experiment in the near future, giving careful consideration to the fertility of eggs in the spring, in 'starved' and 'fed' pens, and the stamina of the birds in both pens at the end of experiment.

FEEDING CAPONS AND COCKERELS.

On December 4, 1912, fourteen capons and fourteen cockerels were placed in two pens side by side and, though it was not intended as an experiment, the results are interesting.

None of the birds was first-class; they were too late to make breeders and, like most late birds, not as thrifty as the early hatched. They were Rocks, Orpingtons and Wyandottes.

The capons, as well as the cockerels, were allowed to run until shut in on December 4.

The feed was whole grain (wheat and oats) in the morning, bone and beets (alternately) at noon, and at night a wet mash composed of two parts corn meal, one part shorts, and one part ground oats. They were given all they would eat of this mash. No account was kept of the weight of the feed eaten. Both lots ate heartily, and did well on the feed. The gains, however, are by no means large, and the table is given to show the relative average gains, the capons gaining 50 per cent more than the cockerels.

TABLE showing the average gains of cockerels and capons fed in pens for two months and ten days.

<table>
<tr><th rowspan="3">Number of Birds.</th><th rowspan="3">Breeds.</th><th rowspan="3">Cockerels or Capons.</th><th colspan="2">AGE.</th><th colspan="12">WEIGHT.</th></tr>
<tr><th rowspan="2">Months.</th><th rowspan="2">Days.</th><th colspan="4">Dec. 4, 1912.</th><th colspan="4">Feb. 14, 1913.</th><th colspan="2" rowspan="2">Total Gain.</th><th colspan="2" rowspan="2">Average Gain.</th></tr>
<tr><th colspan="2">Total.</th><th colspan="2">Average</th><th colspan="2">Total.</th><th colspan="2">Average</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>Lb.</td><td>Oz.</td><td>Lb.</td><td>Oz.</td><td>Lb.</td><td>Oz.</td><td>Lb.</td><td>Oz.</td><td>Lb.</td><td>Oz.</td><td>Lb.</td><td>Oz.</td></tr>
<tr><td>14</td><td>B. Ply. Rocks, Orp. and Wy.</td><td>Cockerels.</td><td>4</td><td>15</td><td>44</td><td>00</td><td>3</td><td>2</td><td>72</td><td>00</td><td>5</td><td>2</td><td>28</td><td>00</td><td>2</td><td>00</td></tr>
<tr><td>14</td><td>" " " ..</td><td>Capons ..</td><td>4</td><td>20</td><td>46</td><td>00</td><td>3</td><td>5</td><td>88</td><td>00</td><td>6</td><td>5</td><td>42</td><td>00</td><td>3</td><td>00</td></tr>
</table>

EXPERIMENTAL STATION, LACOMBE, ALTA.

A beginning has been made toward the establishment of a poultry plant. A number of colony houses were erected in March. Breeding pens have been mated of the following breeds of chickens: Barred Rock, White Wyandotte, Buff Orpington and Rhode Island Red.

Small flocks of Bronze turkeys and Toulouse geese have been purchased. The coming year should witness rapid development in the poultry department.

EXPERIMENTAL FARM, AGASSIZ, B.C.

At the present time we are keeping three breeds, Single Comb White Leghorns, Barred Plymouth Rocks and Single Comb Rhode Island Reds. The flock consists chiefly of the first two breeds.

As is probably the experience of almost everyone starting in the poultry business, we have found that the first year is rather expensive in buying all the equipment and getting houses and yards in proper shape.

When properly handled, the poultry business should be a profitable one, but unless attention is paid to every detail and the most returns collected from every source, the expenditure will out-balance the income.

During the season we raised some four hundred and fifty chicks in an enclosure containing plenty of shade and grass and sufficient run for the number of birds confined. However, these chicks did not do nearly as well as the portion of the flock which were allowed to run about the yards and that were not confined until they had arrived at the destructive age.

In order thoroughly to test out some incubators, chicks were hatched in June, but these proved decidedly unprofitable, which is quite a current idea, and this only adds one more item to the list of evidence that it does not pay to hatch late chickens.

The trap-nesting work, with sixteen Barred Plymouth Rocks for three hundred and sixty-five days, gave us some varied figures; the highest producing hen gave two hundred and thirty-one eggs, and the lowest seventy-one. The average of the sixteen hens was one hundred and fifty-six and one-half eggs each, and of the fifteen (dropping out the hen which only laid seventy-one eggs) was one hundred and eighty-two. These chickens were housed in a Tolman house and allowed free access to a good-sized grass plot.

During the season we had a small cellar dug, at spare moments, and before hatching time this spring we had a cement wall built around it and covered over for an incubator cellar, but the conditions were not conducive to the best results. Last season in this cellar we tested out, under these conditions, three incubators of small size, but the relative standing of the machines has been reversed this season under better conditions, so do not wish to make any report on the makes of incubators at present. We have this season purchased, in addition to the three mentioned, a Cyphers No. 3 four-hundred-egg machine. We will run these to their full capacity as long as the hatching season lasts in order to have a good supply of poultry to select from the coming fall, and in order to do more detailed and accurate work. At the time of writing, the machines tested out are showing eggs of not very strong fertility. Of the three houses which we have tested for two winters, the Tolman house has probably given us the best all-round satisfaction. The Gilbert house (plan supplied by Mr. A. G. Gilbert) is well adapted to this country, but it is not deep enough. The Woods open-front house, although deep enough to keep the fowls well away from the draft, is not so handy to work about, and does not warrant the extra expense in building it.

A large house has been built for laying purposes, one which contains four pens 18 by 20 feet, with the feed room in the centre. This is built somewhat after the style of the Gilbert house, only larger and, under the conditions which we have in this district, is probably more satisfactory. We are indebted to Mr. A. G. Gilbert, of the Central Experimental Farm, for his ideas regarding the construction of this house.

Our poultry department for this season has not received the attention which is due such an important industry in this province, but the work has been reorganized and, during the coming year, we will be in a position, financially and otherwise, to report a considerable advance in this line of work.

THE PRESERVATION OF EGGS.

BY

FRANK T. SHUTT, M.A., *Dominion Chemist.*

Experiments in egg preservation have been carried on by the Division of Chemistry during the past fifteen years, in order to obtain information for our numerous correspondents as to the best preservative for use in the home. In this long period a large number of fluids and preparations advertised as egg preservatives have been put under trial. These, for the most part, have proved utter failures, and, looking back over our records, we cannot find one of these numerous nostrums that can be unhesitatingly recommended.

The two best media are lime water and a solution of water glass (sodium silicate) and these two have been tested side by side, year after year, with the same result—that lime water has shown itself the more effective preservative.* Not infrequently eggs have been kept in this medium, quite sound and fit for cooking purposes, for more than a year. The three essentials to success are, absolute freshness of the eggs when placed in the lime water, protection of the surface of the lime water from the atmosphere (or occasional renewal of the lime water) and the keeping of the vessel containing the eggs at a moderately low temperature—preferably 40° to 45° F.

COMBINE BARRAL.

This recently introduced preparation for the preservation of eggs is apparently made in France, but is sold to some extent in Canada and the United States. To furnish information to correspondents regarding its nature and merits we, last summer, submitted it to analysis and at the same time made a practical trial with it in the keeping of eggs.

It is put up in the form of small cakes (weighing about 3 ounces each), of a light yellowish tinge, hard and brittle, breaking with a somewhat glassy or conchoidal fracture. Each cake, it is stated, yields sufficient preservative fluid for 100 eggs. It is described in the circular advertising it, as a chemical combination, antiseptic and non-poisonous, and the statement is made that it will preserve eggs for nine months in the same condition as when laid. The directions are to dissolve one cake in seven pints of cold water, stirring four or five times during two days to hasten solution. A slight deposit settles out, but this is allowed to remain.

Analysis showed it to consist essentially of lime, a gum (probably gum arabic), and boracic acid. It forms a thick solution or emulsion with water, leaving very little residue. It effervesces slightly on the addition of acid, showing that a portion of the lime had become carbonated.

Two dozen strictly fresh eggs were placed in the Barral preservative prepared according to directions on October the 4th, 1912, the vessel being kept in the cellar of the laboratory. The examination of the eggs was made on June the 4th, 1913, when the following notes were made:—

On breaking, the yolks in the larger number were found to be fairly globular, but the retaining integument in some instances had materially softened, as shown by a slightly flattened appearance and a tenderness which made it somewhat difficult

*A circular describing the preparation of lime water and water-glass solution will be forwarded on application to the Central Experimental Farm, Ottawa.

to avoid breaking the yolk on opening the egg. The 'whites' were considerably discolored, and decidedly limpid. A markedly stale odour had developed. Though not in a condition fit for table use, the eggs were apparently sufficiently well preserved for cooking purposes.

An experiment was carried on concurrently with the above, using lime water, the object being to compare eggs kept with this well-tried and successful preservative with those from the Barral preparation. The eggs were put into lime water October 4, 1912, and examined June 4, 1913, the conditions as to temperature, etc., during that period being those to which the Barral eggs were subjected. On examination, the yolks were found to be globular and in good condition. It was not at all difficult to open the eggs without breaking the yolk. The 'whites' were slightly discolored, but otherwise they were normal in appearance. The odour of the opened eggs, though slightly 'stale,' was not so marked as in the case of the Barral eggs. Tested side by side the lime eggs were, in all features, distinctly superior to those which had been kept in Barral. A number of these lime-water eggs were distributed for a table test. The eggs were by some poached and by others boiled in the shell, and eaten. In all cases they were reported as being found in the best of condition and pleasant, though in the opinion of some with a slight flavour of staleness.

Our experiments have, therefore, once more proven the efficacy of lime water for egg preservation. It is useless to expect that any preservative will entirely arrest that 'stale' flavour which develops on the storage of eggs. The freshly-laid egg is in a category by itself. But lime water, under the conditions stipulated, will allow the householder to keep eggs over for 6 to 10 months in a sound and perfectly satisfactory condition, and quite suitable for culinary purposes, if not for table use.

BLACK-HEAD IN TURKEYS.

(Entero-Hepatitis.),

BY

C. H. Higgins, B.S., D.V.S., *Chief Pathologist, Health of Animals Branch—Department of Agriculture.*

Entero-hepatitis, or black-head, in turkeys is a disease of fowl, infectious in its nature, usually seen in its most aggravated and fatal form among turkeys. Other fowl may be subject to the disease, but losses among them are small compared with the loss among turkeys. The first investigations as to the nature and cause of the malady were made by Dr. Theobald Smith, in Rhode Island, under the joint auspices of the United States Department of Agriculture and the Rhode Island Agricultural Experiment Station, during 1894 and 1895. Various investigators have since taken up the study of the disease as it has become more widely distributed and a distinct menace to the turkey-raising industry. Detailed information relative to the manner in which the disease is transmitted from an affected to a healthy bird is lacking. It is believed that this infection is direct from the droppings or from the ground on which they have been deposited. There is still some difference of opinion as to the exact organism responsible for the lesions produced, but it is generally conceded to be a minute protozoan parasite. We anticipate conducting experiments and hope to be able to arrive at some definite conclusions regarding these and other unsettled points.

LOSSES.

The losses from this disease have been enormous, and I believe that it is a factor responsible for the high price of turkeys. The extent of these losses is well indicated from the fact that two decades ago a single small island (Block island) off the Rhode island coast provided two tons of marketable birds each year, while to-day but five hundred pounds are available from the same locality. Statements are also current that in localities in Ontario where ten carloads of birds were available eight years ago it is now difficult to secure two carloads. The reason to be ascribed for this falling off in production is the difficulty of rearing stock that can withstand this affection.

In Canada the disease was first mentioned by Gilbert in the Experimental Farms Report for 1900. It has since been repeatedly reported upon evidence obtained at this laboratory and at the Bacteriological Laboratory of the Guelph Agricultural College. From the information which we have obtained through communications received at this laboratory, it is evident that there is not a province in Canada where entero-hepatitis does not make its presence felt with more or less severity each season. In some portions of the country the disease has made such inroads on the turkey industry as to almost prohibit the raising of this class of fowl.

The usual history concerning losses is that an individual having a few fowl desires to supplement his poultry operations by raising a few turkeys. He is an unsuspecting buyer of parent stock or sittings of eggs until experience has made him painfully aware of the fact that he has bought with the birds or eggs the infective agent of this disease which later separates him from his original investment and the

time he has spent in caring for the young poults. The season is then too late for him to attempt another start, his premises are infected, and, discouraged at the result, he decides to relinquish further effort in this direction. It is quite common where entero-hepatitis makes its appearance to lose seventy per cent of the young stock before they are sufficiently mature for table purposes.

NATURE OF THE DISEASE.

The early symptoms presented by affected birds are not particularly characteristic. Affected birds, however, will separate from the remainder of the flock. This separation or lagging behind does not appear to be a desire for seclusion but the result of being unequal to the task of keeping up with the others, from physical exhaustion. The droppings are more fluid than normal, and may be streaked with yellow. Gas bubbles may be sufficiently numerous to give a frothy appearance. The head may be, and usually is, darker in colour than normal. This dark colouration may disappear and reappear at irregular intervals while the bird is at rest, but excitement usually causes a bright red colouration.

The best means of early diagnosis is the examination of the droppings for evidence of diarrhoea or a yellow colouration of the faeces. Feeding time may prove the most appropriate for such observation. Where this is not convenient, owners should provide some means of determining an infection at the earliest possible moment.

COURSE OF THE DISEASE.

Affected birds, if untreated, may die in a few days or may linger for a week or longer after the first appearance of symptoms, according to the virulence of the infecting agent. In some cases the onset is so rapid and free from outward manifestations as to be recognizable only by an autopsy. Without treatment, or a complete change in diet and surroundings, the course is usually fatal.

POST MORTEM FINDINGS.

The post mortem findings are characteristic. The lesions are confined to the liver and intestinal tract. The liver is the seat of lesions which appear on the surface as circular spots about the size of a five- or ten-cent piece, yellow or whitish yellow in colour and surrounded by what, to the naked eye, appears to be normal liver tissue. At the point between the lesion and the liver tissue, a ring, almost bright red in colour, is observed. These lesions in the liver if cut open may have a uniform colour throughout, or, in the more chronic cases, there may be a core in the centre. The intestines may be the seat of a chronic inflammation. The caeca or two blind guts which lie along the course of the intestine, and enter it about six inches from the vent, are usually inflamed and in either or both, a single or number of lesions the size of a walnut are usually present. These lesions are yellow in colour, have a thick wall and a degenerated centre. There may be in addition to the above in severe, acute or chronic cases, either a localized or general peritonitis (inflammation of the outside wall of the intestines) with adhesions and fluid in the cavity.

PREVENTION AND TREATMENT.

The placing of the poults on clean, sanded board floors in a dry well-lighted and well-ventilated building with a southern exposure, is considered a means of prevention. The continued contact with the floors, however, tends to weaken the poults. I believe it to be an advantage to see that they are quartered on sanded board floors at night and prevented from ranging in the early morning when the grass is wet.

When the birds are older, the roosting places should receive consideration. The free application of lime and sulphur wash (that used in spraying fruit trees is suitable) on the ground under the roosting places and the ground on which they are reared, two or three times during the season, will destroy any infection on the ground. We believe that persons raising turkeys should be very careful not to introduce the disease when making additions to improve their stock A turkey tom may be a source of infection when he heads the flock of a neighbourhood, or the disease may be introduced with sittings of eggs. The greatest care should be exercised to prevent any possible source of infection reaching a flock or locality now free from disease.

The early diagnosis of the first case is an essential feature in connection with the prevention and treatment. As has already been indicated, it is the early diagnosis that will prove the most essential factor in successful prevention and treatment. The isolation of the first case may many times prevent further manifestations of the disease. From our experiments, however, it appears that there may be chronic carriers of the disease whose droppings are continually infected, notwithstanding the fact that they exhibit very slight if any symptoms. This suggests that isolation may not be as potent a factor in preventing losses as desired, but I believe that it should be enforced to such an extent as will prevent the old and young flocks intermingling after the first appearance of the disease.

Our experiments in the treatment of entero-hepatitis have been directed to the finding of some agent that will successfully carry affected birds over an acute attack and enable their being conditioned for market.

There is to my knowledge no known specific for controlling the ravages of this affection. The use of muriatic acid in the drinking water was found some six years ago to be followed by beneficial results on affected turkeys which I was trying to raise at my home. Later it was given a further trial and three years ago a single turkey at this laboratory made an apparent recovery. During the past two years we have recommended it as being the best medicinal agent which we know to assist in overcoming the affection. Last year five affected birds recovered after receiving liberal allowances of this acid. One of these which was later autopsied to determine the presence or absence of lesions, was found to be normal in every respect so far as we could determine

Some apparently remarkable recoveries have followed the use of this acid, but one cannot hope to bring all affected birds through an attack. I was first prompted to use this acid as I found that the contents of the digestive tract in turkeys, dead of entero-hepatitis or black head, were alkaline in reaction.

The acid to be used is a teaspoonful of muriatic acid *(Acid. Mur. Dil B.P.)* in a quart of drinking water. This acidulated water should be placed in a porcelain or glass vessel, and is suggested in the hope that the birds may be carried over an acute attack. At the outset, when the birds show evidence of being severely affected, it may be of advantage to triple the amount of acid (using three teaspoonfuls to the quart of water) for the first three days. This amount will not injure the turkeys, and may assist them in more rapidly overcoming the infection.

They should be confined during this period on dry, sanded board floors in well-lighted and well-ventilated quarters and allowed access to no other liquid. If allowed to roam they may obtain sufficient water for their requirements from the dew laden grass or other sources and, therefore, will not drink the acidulated water. If confined, green food should be supplied in addition to the grain ration.

Other medicinal agents may give equally satisfactory results in the treatment of affected birds as that above outlined, in which case my advice would be to stick to the remedy that has proven the most effective. If such other medicinal agents are effective we will appreciate learning of them. We will also appreciate information as to the success or otherwise of the treatment herein recommended.

INSTRUCTIONS FOR SENDING MATERIAL FOR EXAMINATION.

Where it is desired to determine the nature of any condition causing losses among turkeys, an examination will bo undertaken, provided suitable material is supplied. It is preferable to have affected turkeys forwarded alive by express in order that a thorough autopsy may be made. The express charges are paid by the Biological Laboratory. When the condition has been found at autopsy the tissues may be sent by mail, if properly packed and preserved. Tissues may be preserved in fine alcohol or a solution of one part of formaldehyde to nine parts of water. After an examination has been made, suggestions will be forwarded for the prevention of further loss. Specimens sent should be addressed to the Biological Laboratory, Ottawa, Canada.

Information concerning the losses which have been experienced should be sent with the material, in order that it may be properly identified. The name and address should be written plainly in order that the result of the examination may be forwarded to the sender with the least possible delay.

TUBERCULOSIS IN POULTRY.

BY

C. H. HIGGINS, B.S., D.V.S.

Tuberculosis, or consumption, is a disease that affects fowl as well as human beings, cattle, hogs and other animals. It is caused by a bacillus or germ which is only distinguishable from the germ seen in other animals by elaborate laboratory methods. This affection among fowl was first identified in western Ontario by Prof. F. C. Harrison, in 1901, Prof. F. C. Elford, in 1903, and by the writer, in fowls received at the laboratory on May 30, 1904, from British Columbia, for an examination to determine the cause of death. Since 1904 the disease has been found by us to be the cause of losses to poultry owners in various parts of British Columbia, and also in Quebec, Ontario, Saskatchewan and Alberta. It may be and probably is the cause of losses in other provinces. The disease has also been frequently reported from the Bacteriological Laboratory of the Guelph Agricultural College.

LOSSES.

The losses from this disease have been large to poultry owners, but there is at present no means of arriving, even approximately, at an estimate with any degree of accuracy. Once the disease makes its appearance in a flock the aggregate losses are large, although a great number of birds do not usually die at one time.

The following, which is an extract from an inquiry made by a large poultry plant when sending an affected bird for examination, is quite the usual experience where tuberculosis makes its appearance in a flock:—

> 'We have lost as many as a hundred fowls with this disease during the past two years. They go light and gradually grow weaker, having a yellow or greenish diarrhoea; some eat to the last, others do not. We have fed mixed grains, also mash, but they have been eating a large quantity of wheat screenings. We find many of our chicks go the same as the older hens, dying at all ages. We are beginning to think that artificial hatching has something to do with it, and we are afraid it is tuberculosis caused by the overheated air of the incubator during the hatching season. We try to keep the conditions favourable around the houses and yards.'

In commenting on the above it is only necessary to state that tuberculosis being due to a definite infecting germ, the overheating of the incubator or other conditions surrounding the chicks or fowl will not induce the disease unless the infecting germ is present. The surrounding conditions may render the fowl more susceptible but cannot produce the disease.

NATURE OF THE DISEASE.

Tuberculosis, or consumption, in fowls, as in other animals, is a contagious disease caused by a bacillus or germ. This germ gains entrance to the system, usually with the food, and finding a favourable location grows and extends to the various tissues. This growth of the germ induces symptoms of unthriftiness, and this unthriftiness is followed sooner or later by death. The detection of tuberculosis from

the symptoms is not always easy. Some may be observed to be 'going light,' yet they are seen to be good feeders. If picked up, it is found that the flesh has almost entirely disappeared from the breast bone and this should make one suspicious that something is wrong. A yellow or greenish diarrhoea is frequently present in affected birds, and where this is present the type of the disease is most dangerous to the remainder of the flock, as the germs are to be found in the droppings in immense numbers. One of the most frequent symptoms seen early in the course of the disease is lameness, a result of the infection involving a joint of the leg. Lameness is mentioned by persons forwarding fowls for diagnosis more frequently than any other symptom, where our subsequent examinations have proven the trouble to be due to tuberculosis. So frequently is lameness the principal symptom observed that I am at once suspicious of tuberculosis whenever it is mentioned.

COURSE OF THE DISEASE.

Fowl affected with tuberculosis may die in a few days from the first appearance of symptoms, or they may linger for weeks, gradually becoming more emaciated as the disease progresses, until they die from exhaustion. The progress is largely dependent on the strength of the invading germ and the natural resistance of the bird. Some outbreaks of the disease follow a more rapid course than others; usually, however, the course in an individual extends over weeks, and sometimes months may intervene before death takes place.

POST MORTEM FINDINGS.

The post mortem findings in fowl tuberculosis, when considered in relation to the symptoms and general history, are characteristic. The liver is usually the principal organ affected, and there are lesions, from the size of a pin point to that of a large pea, which are white or yellow in colour. The larger lesions, when cut into, give a gritty sensation as the knife passes through them. These lesions are distinct from the liver tissues and may be quite easily separated from the liver itself. In the more acute cases the liver may be greatly enlarged, even to twice its normal size. This enlargement in chronic cases is noticeable The spleen is usually involved, the lesions having the same characteristics as mentioned for those in the liver. The enlargement of the spleen is usual, and it may be four times its normal size. The intestines may or may not be involved. When lesions are present we find nodules from the size of a small pea to that of a medium-sized nut. The minute dissection of these usually presents a free opening into the inside of the bowel, and at this point of entrance there is an ulceration. It is through this opening from the nodule on the intestine to the interior of the bowel that the bacilli gain access to and are so easily distributed by the droppings.

Other visceral organs are seldom involved. It is frequently observed that the joints, notably that of either or both hips, may be the seat of tubercular ulcerations. Such an ulceration is the cause of lameness during life.

PREVENTION AND TREATMENT.

In the prevention of tuberculosis and other infectious diseases of fowl, sanitary surroundings, with plenty of sunlight and fresh air, are requisites of prime importance. In our opinion, these features are best obtained by the use of the modern cotton front house, a number of types having been described by various poultry authorities. Circular No. 7, prepared by Prof. A. G. Gilbert, of the Experimental Farm staff, describes in detail the method of construction, and may be obtained on application.

The best means of preventing and treating tuberculosis in fowls is to destroy the entire flock if all have been running together, and to thoroughly cleanse and disinfect the quarters which they have occupied with any good disinfectant, one of which is a five per cent solution of crude carbolic acid. This may be made by adding two teacupfuls of crude carbolic acid to a pail of hot lime wash. This should be applied with a spray pump, brush or old broom to all parts of the house occupied by the fowl. This method of disinfection is suggested, owing to the fact that in tuberculosis or consumption in fowls, as has already been indicated, the bacilli or germs are found in the droppings in great numbers, and these should be destroyed. This action is further recommended as it has been shown that fowls dead of tuberculosis, if eaten by hogs, communicate the disease to them, and it is probable that the droppings would also communicate the disease in a similar manner.

When destroying the birds after it has been demonstrated that tuberculosis is present, some may be suitable for food if an examination of the livers shows no yellow or white spots from the size of a pin point to that of a pea, and there are no nodules or lumps on the intestines. When these lesions are present the flesh cannot be considered suitable for human food.

We have found that eggs from tuberculous fowls may contain the bacilli or germs in the white, and others have demonstrated that they are in sufficient numbers to infect small experimental animals. This suggests a possible source through which tuberculosis may be introduced into a flock, namely by the unsuspecting purchase of eggs from someone who has tuberculosis among his fowl.

The drastic measures above recommended should be followed in all cases when tuberculosis appears among fowl. These measures, while temporarily entailing a considerable loss, will in the end prove the most economical to the owner and the community.

INSTRUCTIONS FOR SENDING MATERIAL FOR EXAMINATION.

Where it is desired to determine the nature of any condition causing losses among fowl, an examination will be undertaken by the Biological Laboratory, Ottawa, providing suitable material is supplied. If possible, two live but affected birds should be forwarded by express in order that a thorough autopsy may be made. It is not necessary to prepay the express. When the condition has been found at autopsy the diseased tissues may be sent by mail, if properly packed and preserved. Tissues may be preserved in pure alcohol or a solution of one part of formaldehyde to nine parts of water. After an examination has been made suggestions will be forwarded for the prevention of further losses. Specimens sent by express or mail should be addressed to the Biological Laboratory, Ottawa, Canada.

Information concerning the losses which have been experienced should be sent with the material in order that it may be properly identified. The name and address of the sender should be written plainly so that the result of the examination may be forwarded with the least possible delay.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

REPORT

FROM

THE TOBACCO DIVISION

For the Year ending March 31, 1913

PREPARED BY

Chief of the Tobacco Division - - - - - - - - - - - - - - - - - - - F. Charlan.

REPORT FROM THE TOBACCO DIVISION.

OTTAWA, March 31. 1913.

J. H. GRISDALE, Esq., B.Agr.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the report of the Tobacco Division for the year ending March 31, 1913.

The work of the Tobacco Division, during the year 1912, was conducted on that part of the Experimental Farm at Ottawa devoted to tobacco experiments, and also on the Experimental Stations at St. Jacques l'Achigan, and at Farnham, Que., and Harrow, Ont.

The Experimental Station at St. Césaire was given up during the spring of 1912 on account of its small size and its lack of communication facilities. Its place has been taken by the Station at Farnham, some 74 arpents in size, situated on the outskirts of the town of that name, and near the railroad. This increase in area of the Tobacco Stations in the province of Quebec will permit us to grow a sufficient quantity of tobacco of each type, or of each variety, for the carrying on of the fermentation process in the most suitable way.

CENTRAL EXPERIMENTAL FARM.

The fermentation warehouse on the Central Experimental Farm, which should have been ready for use in September, 1911, was not finished until February, 1912. The sorting of the tobacco was immediately commenced, but the fermentation did not really begin until the 11th of April, the date of the building up of the first bulk.

The foreman, Mr. Richard Brault, engaged on the 12th of April, was put in charge, especially of this part of the work, as well as the work on the experimental field at the Central Farm.

It was rather difficult, on account of the delay occasioned by the warehouse not being finished in time, to keep the tobacco sufficiently moist for good fermentation. In reality, it was a little too dry when the formation of the first bulk was undertaken. However, maximum temperatures of 49 degrees Centigrade for the filler tobacco and 51 degrees Centigrade for the binder, were easily obtained. The bulk of binder, which was the larger, fermented more strongly and cooled off more slowly. The total duration was, for the filler, from the 11th of April to June 18, the bulk being turned over twice; the binder, from the 11th of May till the 23rd of September, also with two turnings over.

All the tobacco, therefore, was subjected to three fermentations in the pile. The fillers were baled up on June the 18th, while the binders remained in the bulk until the date of their baling up on the 23rd of September. The reason for leaving this tobacco in the bulk so long, before baling it up, was the late date upon which the third fermentation was practically finished. The great heat of the summer was past, and it was thought that the ripening process would take place better in a fairly large bulk than in cases of 250 to 300 pounds. All the fermentations were completed without accident. When taken from the fermentation heap the tobacco was found

rather light in colour, but fragrant, and without a green taste. The tobacco was sold in October to a Montreal manufacturer.

SEEDLINGS.

As in former years, these were grown in hotbeds. The hotbeds were treated with formalin, but instead of sprinkling the mould in a heap and working it up, it was sprinkled after the hotbeds had been prepared. The dry seeds were sown on the 24th of April, and the seedlings were of sufficient size for use on May 28, on which date transplantation was commenced.

The tobacco plantation on the Central Farm is becoming more and more devoted to the growing of seed intended for distribution and to the study of new varieties, or those newly introduced into Canada. Thus, in 1912, on an area of about one acre, the following varieties were grown: 3 Comstocks, 1 Wisconsin, 2 Canelles, 1 Bresil Leccese, 1 Big Havana, 1 Montmelian, 2 Moros di Cori, 2 Erbasantas.

Transplantation was finished on June 1 and replacements were made until the 5th of June. Showery weather was favourable to the transplanting and the replacements were very few, with the exception of Erbasanta, where the injuries of insects were considerable. It was necessary to replant this variety almost completely. Growth went on at a normal rate. No noticeable difference could be seen between the different Comstocks, although the seed of one of the latter had shown greater earliness in the hotbeds. The Montmelian turned out well, giving a product slightly thicker in texture than the Comstock. The Erbasantas, tried for the first time this year, seemed entirely acclimatized. The Big Havana furnished a tobacco of considerable development, which will be studied further. Unfortunately, the growing season of 1912 was marked by almost constant rain and by a summer comparatively cold, both conditions peculiarly unfavourable to growing tobacco of good texture.

Certain varieties, studied with a view to ascertaining their nicotine content, were particularly affected, the percentage of alkaloid not exceeding 75 per cent of that obtained the previous year, which was a normal one.

Speaking generally, the ripening process commenced late, and harvesting was prolonged from the 20th of August to September 13. In a normal year, on the Central Farm, harvesting is finished by September 5. These unfavourable conditions caused considerable anxiety as to the formation of the seed pods. These formed late, and it was necessary, in order to avoid crossing, to keep them longer than usual under the protecting bags, which was not without danger on account of the latter being constantly moist. The seed pods were harvested on October 7 and 8, after a light frost on September 29, which, however, did no damage. Seed from the tobacco plantation is carefully cleaned and sorted by means of a machine which takes out all the light seed and enables us to distribute choice samples only.

The curing process was carried on during the rainy period, which formed such a saturated atmosphere in the curing barn that part of the product fermented slightly while hanging up. The humidity was such, at a certain time, that the tobacco, already wilted, became fresh again with sap. The result was a small proportion of 'pole burn.'

STATION OF ST. JACQUES L'ACHIGAN, QUE.

This Station is carried on under a 3-year rotation, tobacco, cereals, clover, the last year of which rotation was reached for the first time in 1911, so that the tobacco plantation of 1912 was made on that part of the Station last planted in tobacco in 1909. The varieties grown at St. Jacques were the Cuban, Comstock Spanish and Aurora. The growing of seedlings was successful, with the exception of the bed of Aurora. The failure of this latter is attributed to the poor quality of the seed used.

For the first time since the establishment of this Station, hotbeds were not used. The sowing took place on April 12, the seed having first been swollen. The seedlings were ready for use on June 2. Unfortunately these had to be kept until June 15 for it was impossible, on account of the continual rain, which prevented the preparation of the soil, to commence sooner the work of transplantation. This work was difficult as the cutworms and wire worms did a great deal of destruction and it was necessary to replace some 30 per cent of the plants. The cultivation of the plantation was very laborious on account of the constant packing of the soil under the action of the rain. The ripening was imperfect, as it was necessary, owing to danger from frost, to harvest the crop from the 6th to the 8th September.

The greater part of the seed pods of Comstock had to be abandoned. The pods did not arrive at a sufficient degree of maturity to furnish seed of the first quality. Fortunately, the yield of seed from the tobacco plantation at Ottawa will permit us to meet all demands for samples. In spite of the unfavourable character of the season, the yield on the Station at St. Jacques was satisfactory, amounting to 1,242 pounds per arpent for the Comstock, 792 pounds per arpent for the Cuban, and 1,364 pounds per arpent for the Aurora. The last-named tobacco has particularly attracted the attention of some growers at the annual exhibition at St. Jacques, in January, 1913. The growing process took place normally, although a little slow in commencing. In order to hasten and complete the reduction of the main ribs, it was necessary, toward the end of the operation, to resort to artificial heat, which was obtained by placing small pots of wood charcoal in the lower part of the drying shed.

The tobacco from the St. Jacques Station was sent to Ottawa on February 8 to be sorted and fermented in the warehouse on the Central Farm.

TOBACCO STATION AT FARNHAM, QUE.

The greater part of the tobacco experiments for the province of Quebec, in 1912, were carried on at this Station. On account of the considerable size of the Station and of the delay in obtaining possession of it, which took place on May 28, a time when the seedlings were in good condition for transplanting, and on account of the almost complete state of neglect in which this property had been left for many years, the solution of the making of it, as rapidly as possible, into a model farm was not without many difficulties.

These difficulties were increased, at the beginning, by the unfavourable character of the season. Continual rains prevented work on the fields which were, in addition, flooded by lack of ditches and drains. The ploughing done the previous fall had to be done over again, as it had been performed so badly and so late that the sod turned under was still intact, not having even commenced to rot. In spite of much use of the disc harrow, one could not, on certain parts of the Station, cut up the sod sufficiently to enable one to use the machine planter, which clogged up as soon as the attempt was made to use it. As a result, of ten arpents planted to tobacco in 1912, three were planted entirely by hand.

For all of these reasons, the transplantation, commenced on June 15, was not completed until the 30th of that month, a very late date for this operation, especially in Quebec. In the meantime, the seedlings, which had been ready for use since the 28th of May, grew spindling, or developed crooked roots in the baskets where we had tried to keep them in fit condition until transplanting time by placing the baskets in cellars or cool silos.

The ten arpents planted in tobacco were situated in such different parts of the farm as we had been able to clear, in order to give some idea of the nature of the soil.

The chemical analysis of the soil at the Farnham Station gives fairly encouraging results, in spite of certain admitted differences in the amount of nitrogen contained

in samples taken from different sections of it. It has been found that our first plantations of tobacco were made on that part of the Station which is the least fertile. A fairly heavy dressing of fertilizer in the late spring did not make up for the lack of preparation of the soil. The summer was rainy and cold, and the unfavourable conditions of the season were completed by a hail storm on the 14th of August. The tobacco plants had thrown out roots while covered with water, so to speak; their development was very feeble, and the terminal buds appeared before the usual number of leaves could form. It was necessary, then, to top the plant to a lesser number of leaves, especially in the case of the Bresil and the Rusticas, which lessened the yield considerably, in certain cases reducing it by almost one-half. The varieties tried were the following: Big Ohio x Sumatra, Yamaska, Havana Seed Leaf, 2 Bresils, Comstock Spanish, Bakoum, Blue Makhorka and Cuban.

SEEDLINGS.

The beds for these were got ready on the 12th and 13th of April on the farm of Mr. E. L. Lorquet, whose son was engaged on the Station as foreman. In spite of cold weather and the haste with which the material for the beds had been got together, the seedlings grew quite well. The semi-hotbed was used, made on a foundation of tobacco stems. Unfortunately, on account of the delay occasioned by the preparation of the land, the seed plants could not be used at the proper time. It was necessary, in some cases, to keep them in cellars from eight to ten days, having allowed them to remain in the beds as long as possible. Under such conditions, one could not expect the usual good results and a normal growth after transplanting. The plants from the weakened seedlings were the first to come to flower, and carried the fewest leaves. The destruction caused by insects was considerable. On these dirty lands, parts of which had not been cultivated for twenty years, the cutworms and the moths swarmed. During some two weeks three men were employed almost exclusively in replacing destroyed plants. One plot had to be harrowed up and replanted completely.

The Big Ohio x Sumatra, alone, presented in some degree a normal appearance. All the other varieties gave only half a crop.

The hanging of the tobacco in the curing barn took place during a rainy period, one might almost say between showers. It was finished on September 26, that is to say two weeks later than in a normal year.

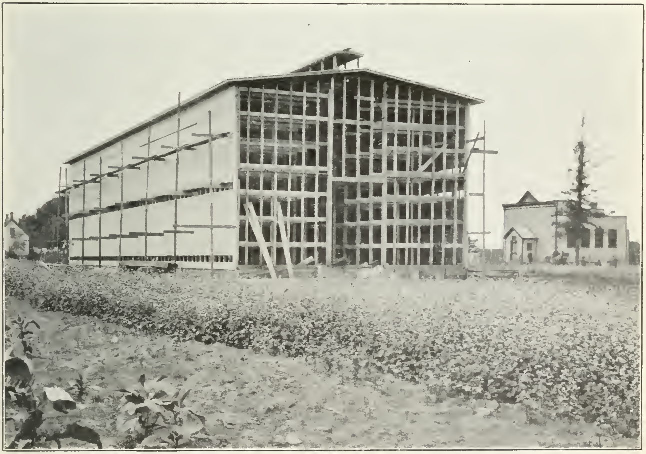
The curing process took place in a normal way, although the humidity which prevailed at the time of the harvest had retarded the wilting and the yellowing of the leaves, and had exposed the product to dangerous fermentation.

After harvest, the plots which had been in tobacco were worked up, as well as the rest of the farm. Manure at the rate of 20 tons per arpent was applied to that part intended for tobacco in 1913. The necessary arrangements were made for carrying off the water in the spring. The levelling of the land was corrected, the ditches cleared out. As chemical analysis had shown, the soil on the Tobacco Station at Farnham is not exhausted; on the contrary, it presents all the indications of average fertility. It is a case of a farm left too long in fallow. It has become covered with an old and dirty sod, under which all microbe life seems to have disappeared. A better preparation of the land than that which we had time to make this spring, together with a light application of chemical fertilizer, along with a better and warmer season, will perhaps enable us to restore this soil. In any event the attempt will be made along the above lines.

BUILDINGS.

The buildings on the farm at the time of taking possession were in such a state of decay that they were hardly fit for use as a temporary shelter for machinery. It was necessary to build a curing barn at once. This is of capacity to hold, in a normal

Harvesting Tobacco on the St. Jacques l'Achigan Station.



Curing Barn in Course of Erection. Farnham Tobacco Station.

year, the harvest of 12 arpents. It was finished in time to receive the first harvest of tobacco on the Station.

During the winter, two other buildings were put up, one containing a stable, a storehouse for material, a small seed room and a stripping room. The other building will serve both for a storehouse and a curing barn. The upper part of it is fitted up for the latter use, and furnished with ventilators. This latter building is covered with galvanized iron, after a model which has already given satisfaction at the Tobacco Station at Harrow for curing Burley tobacco.

TOBACCO STATION AT HARROW, ONT.

The experiments at Harrow, during the year 1912, bore upon the different methods of making seed beds, the different formulæ of fertilizers, and the method of applying the latter. The varieties chiefly used in tobacco growing in southern Ontario, namely, Burley and Yellow Virginia, were, so to speak, the only ones grown on the Tobacco Station at Harrow, rotation as follows, namely, cereal, tobacco and Indian corn. The clover sown with the grain is ploughed under in the spring on the land for tobacco planting. The severe winter of 1911-12 seriously injured the fall wheat sown and necessitated re-sowing the land to spring grain.

The Indian corn plantation was excellent. Certain parts of it yielded up to 145 bushels per acre. The average for the area sown to Indian corn was 115 bushels. The quality of the crop was first-class, and proportion of cobs discarded was very small.

The orchard belonging to the Station has, after two years of treatment, been cleared of San José scale, and the apple crop, although less abundant than that of 1911, contains none but sound fruit.

SEEDLINGS.

As in former years, while other growers in the neighbourhood were looking for tobacco plants, for which they offered up to $3 per thousand, our seedbeds furnished us with an abundant supply at the time desired.

While one can hardly recommend, in a special manner, either the hotbed or the coldbed, one can hardly insist too much upon the necessity of some shelter of glass and of the frequent renewal of the mould used. When the latter cannot be replaced, it is necessary, at least, to disinfect it. Speaking generally, the area devoted to growing seedlings is insufficient. It should be increased, sometimes even doubled, in order to be sure of having enough plants, under normal conditions, to meet the requirements of transplantation.

PLANTATION.

This was undertaken during the first days of June, the weather at the time being rather cool and dry for the season. The setting out was rather difficult on account of atmospheric conditions not being suitable for growth, and also from the destruction caused by cutworms. The latter, fortunately, were checked by the use of poisoned bran. Growth was rather slow. The harvest was commenced on the 21st of September, which is rather late, especially for yellow tobacco of Virginia type. In spite of the unfavourable character of the season, we were able to obtain an abundant supply of white Burley seed which will be quite sufficient for all applications for samples.

The experiments with chemical fertilizers enabled us to obtain, at a comparatively low cost, yields of about 1 ton per acre. These experiments with fertilizers will be systematized in order to enable us to establish the formula which will permit us to obtain, not the greatest yield per acre, but the greatest money returns. Considering the considerable number of formulæ which one can use, and the great number of special fertilizers upon the market, it may be easily seen that the solution of the

question as to which is the best one to use, and to what amount, will not be arrived at for some time.

Experience has shown that nitrogenous fertilizers of all kinds should only be employed with great care in the growing of yellow tobacco. These will hardly ever succeed in our latitude, even on land best suited for their production, except during warm seasons, not too moist, especially towards the time of coming to maturity or yellowing in the field. The growth of the plant should be rapid at the first and should stop early in August. One should, therefore, stop cultivating work about the end of July, confining himself, after that, to suckering and ridding the plants of caterpillars according to the need.

The demand for tobaccos of the Virginia type, cured by the flue-curing process, becomes each year greater, and this in spite of the fact that the ideal colour is far from being reached. We hope to make a step in advance in 1913 in trying some varieties imported from a region where the climate is more similar to that of Ontario than of Virginia. The curing of the burleys at the Harrow Station was normal. These tobaccos were sold in December, 1912, at 12 cents a pound, the highest market price for the season.

FERMENTATION OF THE 1912 CROP.

Most of the tobaccos from the Station at St. Jacques l'Achigan and at Farnham were transported to Ottawa for fermentation. The Farnham tobacco was sorted at the Experimental Farm, Ottawa, by young girls paid according to the amount of work done by each. This has proven much more satisfactory than employing masculine labour for this purpose. The bulks built up on February 28 and March 1 fermented naturally, higher temperatures being reached than those of the previous year. The first turning over was done on March 19 and March 26, showing tobaccos of a good texture, of colour relatively clear, and of good aroma. Had it not been for the hail which destroyed the greater part of the tobacco crop at Farnham we should have been able to provide the manufacturers with a very high-class leaf.

DISTRIBUTION OF SEEDS.

The samples of tobacco seed distributed by the Tobacco Division contain about one-fourth of an ounce of selected and cleaned seed. The number of samples furnished by the different Stations was as follows:—

Comstock Spanish (Experimental Farm)	3,354
Comstock Spanish (St. Jacques)	120
Canelle (Experimental Farm)	780
White Burley (Harrow)	731
Montmelian (Experimental Farm)	125
Big Havana (Experimental Farm)	12
Moro Petiole (Experimental Farm)	3
Moro Sessile (Experimental Farm)	2

The number of samples distributed amounted to—

Comstock Spanish	1,965
Canelle	777
White Burley	454
Miscellaneous	349
	3,545

I have the honour to be, sir,
Your obedient servant,

F. CHARLAN,
Chief of the Tobacco Division.